News of the Industry Begins Page 145

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AUTOMOTIVE INDUSTRIES

LAND AIR WATER

Volume 68
Number 5

PUBLISHED WEEKLY AT CHESTNUT AND 56TH STREETS
PHILADELPHIA, FEBRUARY 4, 1933

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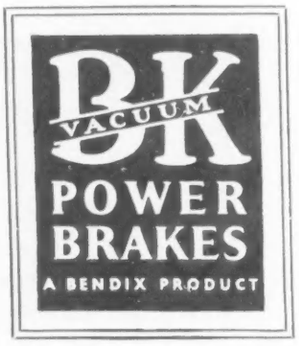
An open letter

to car salesmen who



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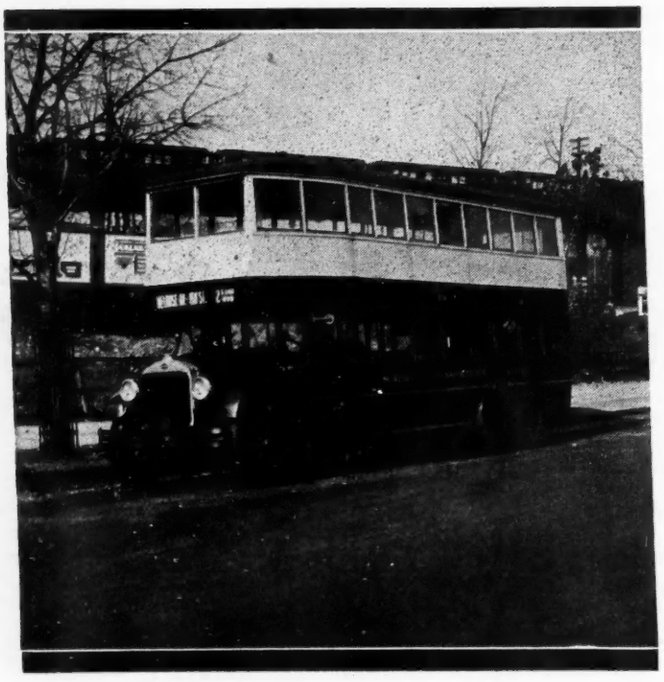

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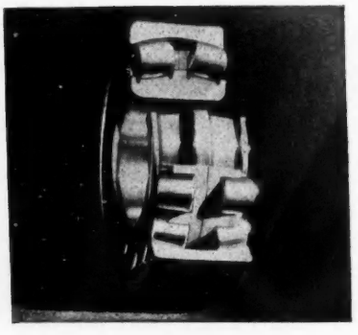

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Volume 68 Number 5

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Contents

Engineering "Reds" Flay Ultra Conservatism Before S. A. E. By Norman G. Shidle and Athel F. Denham 125

Just Among Ourselves 132

280 m.p.h. Top Speed of Blue Bird 133

Final Figures Place 1932 Output Drop at 42 Per Cent 136

The Automotive World in Figures 137

Chrysler "Shoots the Works" in New Plymouth Plant. by Joseph Geschelin 138

Pats Prods and Predictions 143

Automotive Oddities 144

News of the Industry 145

Calendar of Coming Events 152

Advertisers' Index 48

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J. S. HILDRETH, Vice-Pres. and Director of Sales
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Cable Address ..... Autoland, Philadelphia
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OFFICES

New York—U. P. C. Bldg., 239 W. 39th St., Phone Pennsylvania 6-0080
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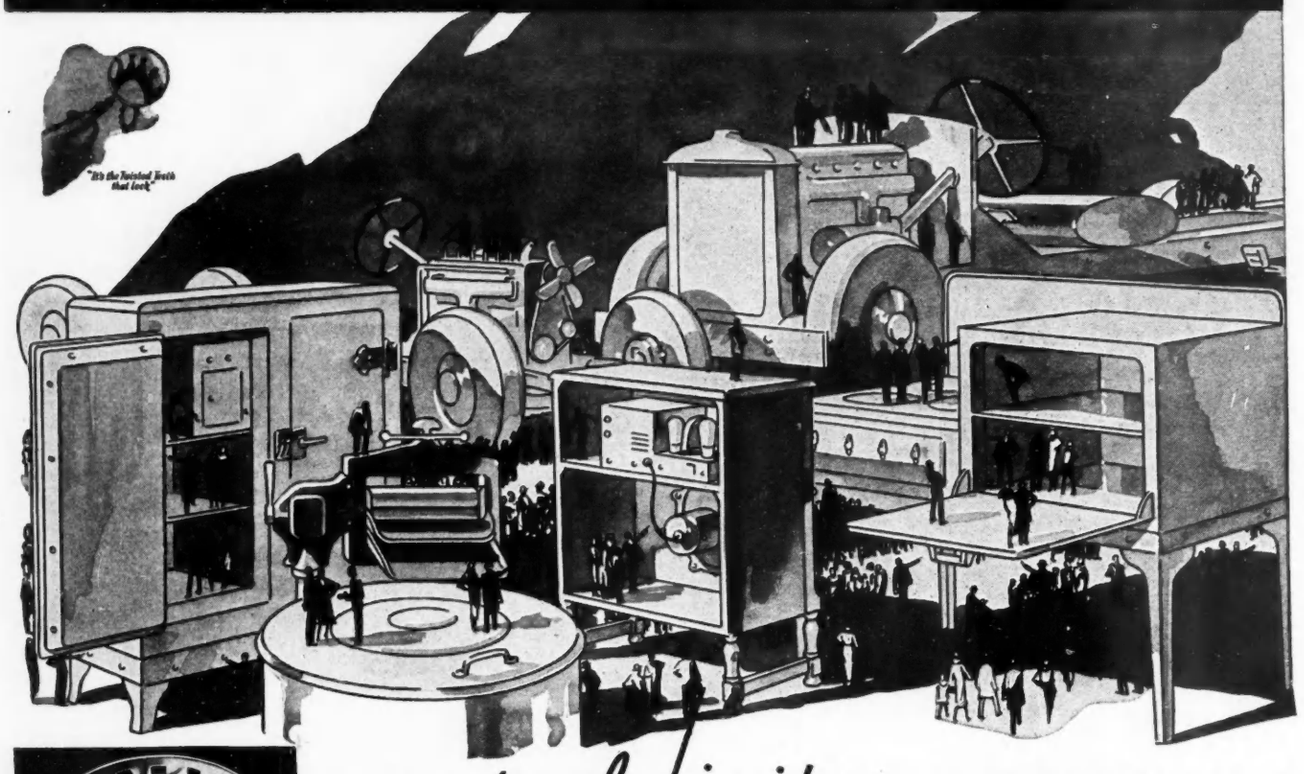

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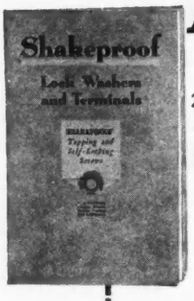

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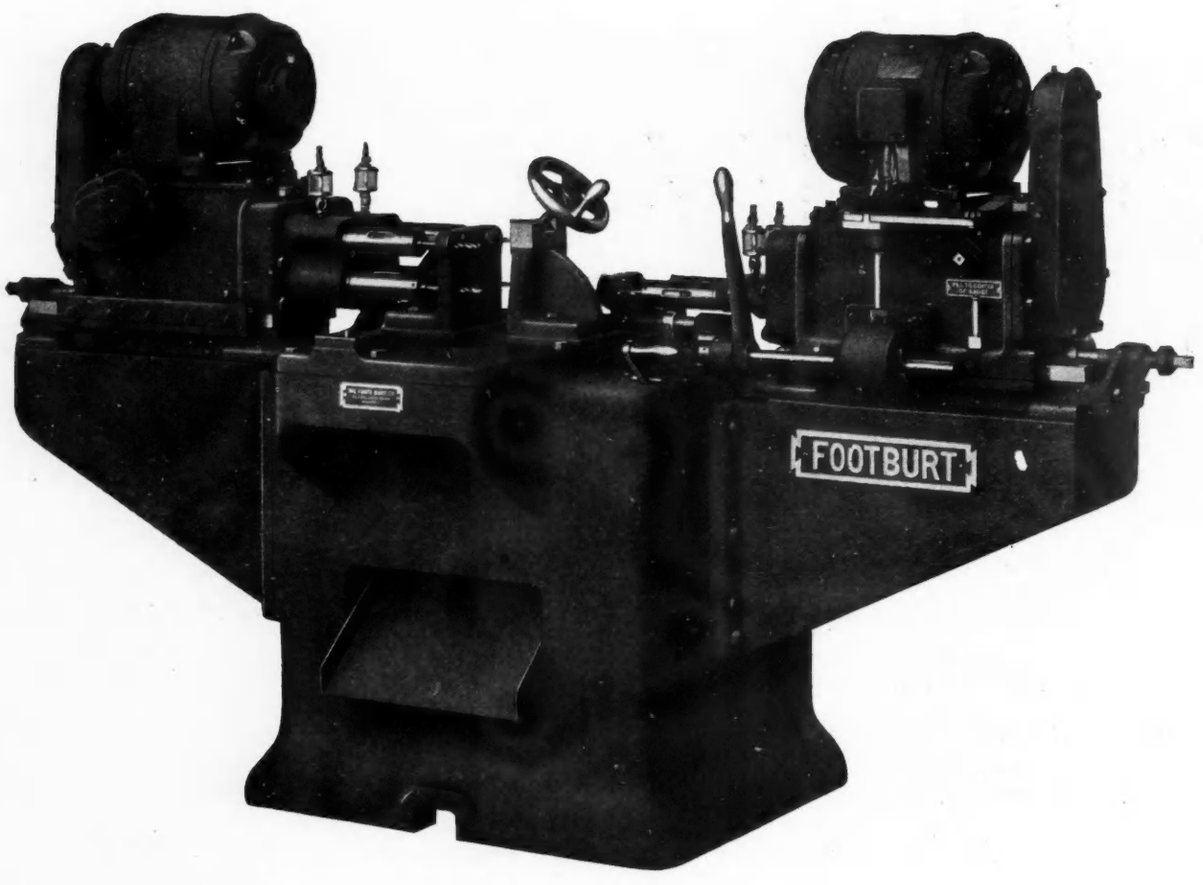

THIS machine illustrates a Footburt 2-Way Drilling Machine using the small 6″ diameter cam units to drive and feed both side heads. These units are in a horizontal plane but could be placed at any advantageous angle. • Footburt's full line of cam units includes three larger sizes, the 10″, 14″ and 16″ diameter cam sizes which provides a size for almost any drilling, reaming or spot facing requirement.

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AUTOMOTIVE INDUSTRIES

Vol. 68, No. 5 • THIRTY-FIFTH YEAR • February 4, 1933

Engineering "Reds" Flay Ultra Conservatism Before S. A. E.

Streamlining and Automatic Transmissions Advocated at Biggest Annual Meeting

Bodies Scored for Poor Vision and Low Roofs

Production Men Talk Labor Relations and Lower Equipment Costs

Dr. Dickinson Prescribes for Economic Ills

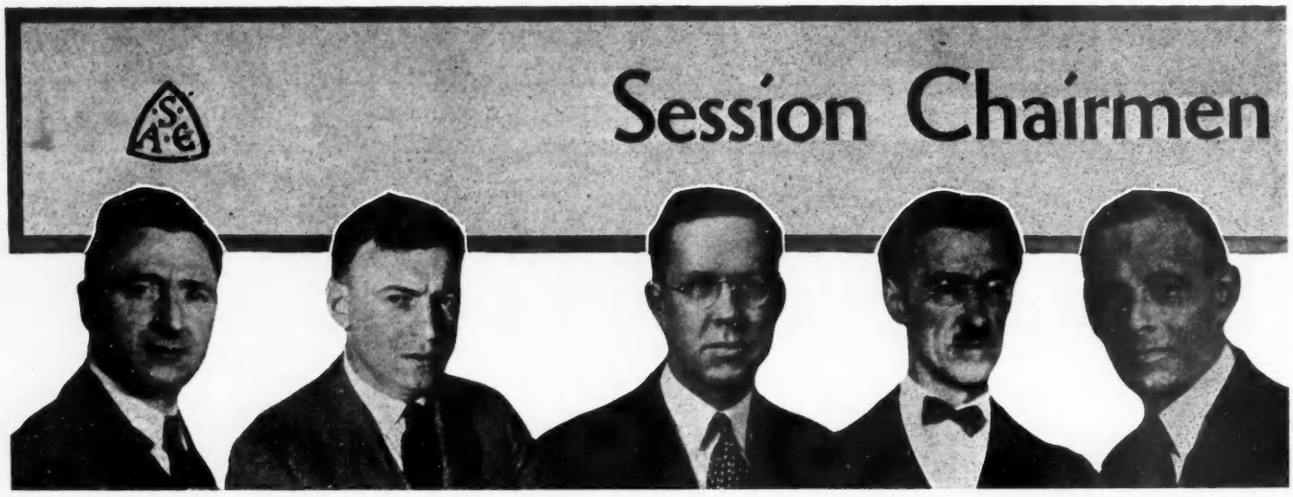
By Norman G. Shidle
and Athel F. Denham

CRIES for more radical automobile design rang out from many technical speakers at the annual meeting of the Society of Automotive Engineers held in Detroit Jan. 23 to 26. They were answered by some other engineers with demands for commercial practicality along with engineering vision and the result was a series of stirring sessions for the largest total attendance ever recorded at an annual of the Society.

Some widely promoted employment policies were vigorously questioned at a confidential luncheon session of the production division and the truck rating committee reached a final conclusion on a truck rating formula which must have council approval before publication.

An outstanding feature of the meeting was presentation by Dr. H. C. Dickinson, newly elected president, of a thoroughly worked out economic theory indicating clearly the possibilities of future economic stabilization

The new president of the S.A.E., Dr. H. C. Dickinson, Director Heat and Power, U. S. Bureau of Standards

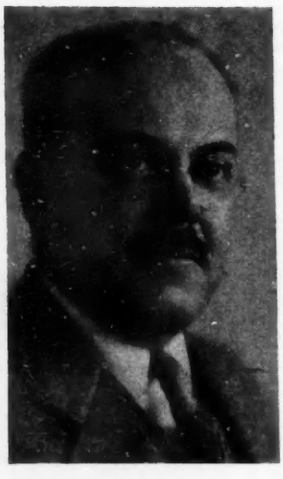


Alex. Taub, Passenger Cars | V. P. Rumely, Production Session | R. F. Anderson, Body Session | W. B. Stout, Annual Session | B. B. Bachman, Motorcoaches and Motor Trucks

through control of the instability now existing between capital goods and consumables. This instability, Dr. Dickinson shows, can be controlled through adjustment of the mechanism itself without disturbing the present competitive system and with far less interference with personal freedom than we are accustomed to at present.

Legislative problems got attention in talks made by T. R. Dahl of White and B. E. Hutchinson of Chrysler. Machine tool builders were prodded by J. E. Padgett, Spicer vice-president, to eliminate beauty, doodads and service charges and sell their products at prices far lower than now are available.

J. H. Geisse in his paper on "Indirect Air Cooling of Aviation Engines" brought to the engineers a wealth of up-to-date information on this subject of high temperature cooling in which there seems to be a growing interest in both vehicle and airplane circles. Other aircraft topics got attention at several sessions, while fuels and lubricants were discussed at length.



B. E. Hutchinson, Chrysler, talked Highways economies

A Fuels and Lubricants Activity has been officially added to the Society and will be represented on the Council by a vice-president, as are the other activities.

The most severe criticisms of current automobile design emanated from Herbert Chase of *Automotive Daily News* and Walter T. Fishleigh, consulting engineer of Detroit and a member of the newly elected Council which took office during the meeting.

Fishleigh called particular attention to "dangers inherent in super-standardization, the price of which is progress," and went on to state that:

"If we started out today to design a fast automobile and were not handicapped by precedent and fashion, our new automobile would not look, act or be mechanically arranged like present automobiles.

"Without courage and foresight," he added, "today's automotive engineering picture is uncertain and disturbing; but with these, the same picture becomes an inspiration and a challenge to engineering to fight its way beyond threatening present-day limitations which, for want of a better term, I have called super-standardization, and to accomplish feats more far-reaching and more important than industry has yet seen."

Herbert Chase was quite specific in a number of his critical suggestions, after starting out with the somewhat blanket indictment that:

"As I see the situation, present cars are much too uncomfortable. They are too bulky, too unwieldly. Even for their size they are too heavy. In consequence they cost too much to build and to operate. They are not sufficiently safe. They are too complex in construction and operation. They involve many petty annoyances. They lack many desirable refinements. They are too hard to service. Aside from these and a few other shortcomings, they are pretty good cars!"

James M. Crawford, chief engineer of Chevrolet, took a more conservative, though none the less dynamic view of the situation, when he asked in his talk following the big dinner Thursday night:

"Will we engineers make the most of our opportunities by considering future development of transportation as an organization problem—or, will we treat it as a strictly engineering job and merit the criticism which so often has been directed at engineers in general? . . . Obviously, we increase our opportunities if we go the Cooperative Route."

Crawford took a gentle slap at the critics of current design when he commented: "The revolutionist is with us, demanding a change. We cannot ignore him. His entire group is composed of lovable fellows who are a real inspiration at times—but how they can get under our skins!

"In 1930, one started his speech by calling us dumb —and we liked it. . . . The aeronautical group, too, seems to be giving us boys in the automobile business a great amount of help. They are educating the public to streamlining and side slipping! . . ."

at Annual Meeting

W. C. Keys, Streamlining | R. W. Brown, Riding-Qualities | A. J. Scaife, Business Session | R. A. Vail, Production Luncheon | H. T. Woolson, Student Session

K. T. Keller, Dodge president, in one of the most important and significant talks ever given at a Society meeting, concluded his not-to-be-published remarks with a six-point summary of the handling of production as a human equation.

The first necessity, he said, is a consistent policy. It should be short, clearly understood and should put real responsibility on the foreman. And it should be changed to meet the times. Above all things, however, the chief executive of the company must keep constantly in touch with its execution. The executive must be close to his job and close to the changes in conditions.

Next, education of the factory supervisory force is essential. Foreman training, properly carried out, pays big dividends. Each plant should develop its own course, adapted to its particular needs.

Third, the system of wage payment which is set up should be such as to permit the foreman to know each day that he has the right number of men in his department and so as to permit the men to earn the sums which management expects them to earn.

Fourth, employees should be dealt with fairly in every way; recognition and consideration should be given to human frailties.

Fifth, a highly competent crew is needed in the employment department.

And finally, labor must be viewed not only as a commodity, but very definitely as a human equation.

Machine Tool Price Reductions

At the production session which followed the luncheon, J. E. Padgett precipitated a brisk argument when he stated his belief that "the machine tool industry could accomplish much if it would arrange to reduce its prices and that this can be done; but the industry will be obliged to get away from its cast-iron type of designing and many of the present manufacturing methods."

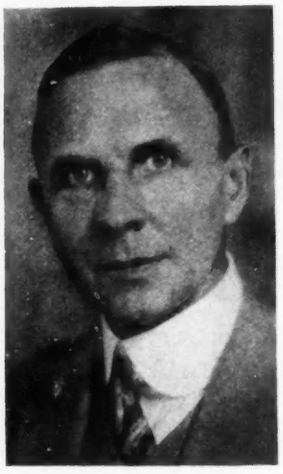
Then he went on to say in part: "A very few machine tool builders have already done a good job of this kind, but this practice certainly is not general. Meanwhile, we in the manufacturing end should not demand unnecessary work or weight for the sake of appearance, and in this way the machine tool builder can save cost. Further, the machine builder should be in the best position to make proper fixtures for use on his machines, but to get most of them to do a good job in this type of work seems impossible.

"In a general consideration of machine-shop practice, we must decide on the correct place for simple single-spindle or single-operation types of equipment as compared with multiple-spindle multiple-operation machines. My experience is that the high-production multiple-tool machine seldom saves anything. Many cases can be mentioned where such machines are a positive saving; but in thousands of other cases they have been found to be a source of great expense and trouble, especially when a change must be made and the cost of retooling becomes excessive. To be economical these machines must be capable of running on a given job over a relatively long period, but seldom, in these days, does any product remain fixed in its design long enough to amortize the tooling. In addition, there is the larger percentage of down time, set-up time and various delays when any single unit gives trouble and stops the entire group of operations. I think I can best express my thought by referring to the banking business.

"In general, we have two kinds of banks in this country. One is a distinctly commercial bank which makes loans only on consumption goods in process of shipment or on the shelves for sale. This is done mostly on 30, 60 or 90-day paper, is backed by the credit of an individual or company and also

T. R. Dahl was the speaker at the Transportation and Maintenance Session

is self-liquidating by the sale of these goods. Such materials are constantly selling, even in times of depression. If the judgment of the lender is good, the bank is practically 100 per cent liquid at all times. On the other hand is the investment-and-mortgage type of bank, in which the money is secured by bonds, stocks, mortgages and other long-term paper, where the judgment as to value is left almost entirely to some stock-exchange quotation. In a time of plenty such securities are easily salable; but in times of depression they become frozen, the values drop out and selling them or collecting the loans made with them as security is almost impossible. In boom times the investment bank makes excessive profits, while the commercial bank works on a narrow profit margin; but in a time of change and depression, the investment bank runs into excessive losses and in many instances actually closes its doors, whereas the commercial bank continues to operate steadily.



Walter T. Fishleigh severely criticized "super standardization"

"I feel that the highly special high-production multiple-operation equipment is like the investment type of banking, making large profits in boom times but becoming badly frozen and highly expensive in times of low production or rapid change. The simple machinery seems to be a little more costly during boom times; but, when adverse conditions come about, this equipment is good for almost anything and in any quantities, can be changed rapidly and at low cost, and over a long period is the safest and most profitable to use."

Mr. Padgett's idea, as he expressed it briefly in discussion, is to "take off the trimmings and services, stop worrying about the appearance and stop sending service engineers around; then cut the price of the product materially.

"Demonstrators aren't needed usually. It's harder for the demonstrator to learn our product and adapt it to the new machine than it is for our men to learn the new machine and adapt it to our product."

Service Adds to Tool Costs

This line of argument brought from Ed Smith, Seneca Falls Machine Co. general manager, the statement that many buyers demanded these things which Mr. Padgett seemed willing to forego. He pointed out also that some effort had already been made to get agreement among machine tool makers on some such policy several years ago, but that it had been impossible to make any progress along this line. Most machines, Mr. Smith pointed out also, are sold with a guarantee as to rate of production, and when the customer can't get that rate out of the machine it is up to the tool builder to go in and make the machine produce what has been promised.

It was also brought out in discussion that the customer frequently fails to tell the machine tool maker in detail just what he wants. He frequently lets the tool builder do a good deal of work on the adaptation of his machine to a particular job, only to ask for major changes later because of facts which had not been given to the tool designer in the first place.

Several tool users emphasized the idea that tools today are too complex. They plead for greater simplicity. I. W. Sprink of Logan Gear Co. particularly urged greater simplicity and also stated his belief that it is all wrong to charge the same depreciation rate on tools when they are operating a few hours a week as when they are operating, as in good times, regularly every day.

V. P. Rumley, chairman of the session, pointed to the need for greater cooperation between machine tools builders and buyers and showed the possibilities of mutual advantage to be gained through such cooperation.

Dr. F. A. Moss of George Washington University, presenting the final report of the committee which has been working on measurement of riding comfort, discussed the requirements of a good measuring instrument and concluded his report with a resume of a series of tests of five people in three current makes of low-priced sedans. Data and charts of the results of wabblemeter, metabolism and reaction-time tests were given and it was shown that the three methods of test rated the three cars in the same order as regards riding comfort. The names of the cars were not given.

Dr. Moss and Carl Kindl Talk Comfort

At the riding comfort session where Dr. Moss talked, Carl Kindl, Delco Products Corp., discussed the details of the new inertia control shock absorber developed by his company. This unit has previously been described in *Automotive Industries*.

Walter Lay, University of Michigan, outlined a series of wind tunnel tests which he has made with variously shaped wooden models of automobiles and showed clearly the possibilities of obtaining greatly decreased wind resistance by utilization of particular body curves. Even slight changes in curvature, his tests showed, sometimes make major differences in air resistance.

At the student session, Dr. H. C. Rentschler, Westinghouse Lamp Co., who has been called one of the world's ten leading scientists, gave demonstrations of the powers and uses of radiant energy, pointing out that "the physical activities that flourish on the surface of the earth derive their energy from the radiation of light and heat of the sun. The mechanism of this transfer of energy is by means of electromagnetic waves, by the vibrations of a medium occupying space somewhat as the energy of

Dr. H. C. Rentschler made some interesting demonstrations

sound is transmitted by the vibrations of the atmosphere."

Other interesting papers presented during the four-day session included a pertinent outline of the advantages and results to be obtained by use of aluminum cylinder heads by F. F. Kishline of Graham-Paige Motors Corp., a paper on "Cushion Spring Comfort" by F. R. Atkinson, Atkinson Spring Co., and a description by Amos Northrup of Murray of results gained from study of foreign body designs.

Col. E. J. W. Ragsdale, of Edward G. Budd Mfg. Co., showed how the pneumatic tired railroad coach can answer many of the problems of unnecessary weight and need for noise abatement which are facing the railroads today. He then described in some detail the rubber tired rail coaches which Budd has built recently and which have previously been described in these columns.

Dr. Dickinson's paper, "The Mechanics of Recovery," after outlining clearly certain fundamental economic laws, proposed a three-point plan for recovery from depression and stabilization of future economic activity in this country. He outlined his program in part as follows:

"Stated very briefly, the plan is (*a*) in an incipient inflation, to divert a part of the unearned increment of capital to increasing *business;* (*b*) in a depression, to increase business and employment by increasing the number of people working, by a process which will cost nothing and yield a profit to all concerned; (*c*) in normal periods of prosperity, not to interfere with distribution.

"To show how this can be done will require a review and emphasis of some points previously discussed.

"(1) *The normal distribution of income should not be disturbed.* This norm results from a complex of forces not under control, and experience has shown that any disturbance of it is likely to be disastrous.

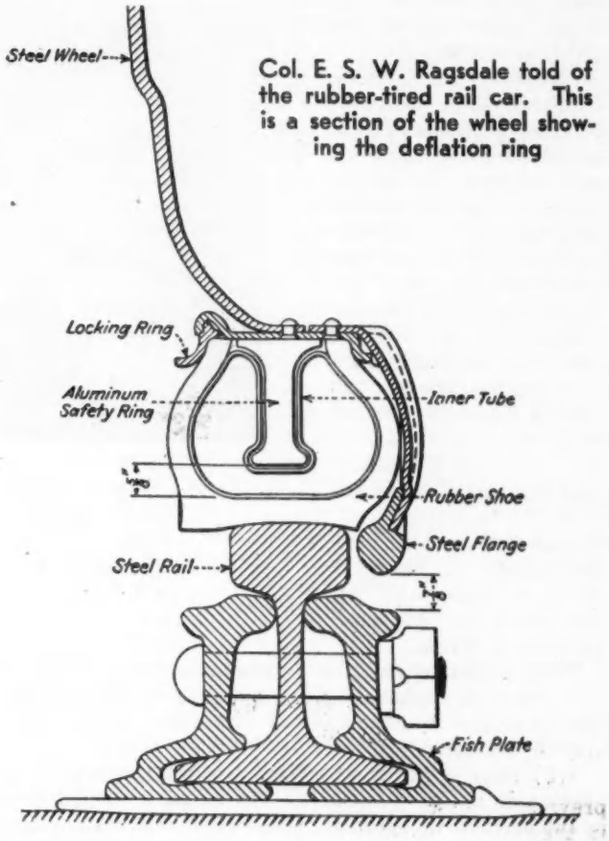
"(2) *Taxes* represent only a redistribution, not a loss, of incomes. This has been shown many times by economists but has not been greatly emphasized or generally understood. However, this feature of taxation is not a necessary one. Taxes can be made non-selective.

"By a non-selective tax we mean one which does not in any way disturb the normal distribution of incomes. An ungraduated and universal tax on net incomes would closely approach this condition. Such a tax has certain very important characteristics which we shall emphasize because of their essential bearing on the proposed method of economic control.

Dr. Dickinson Explains a Non-Selective Tax

"In any *economic* unit, such as a nation or even a State or city, a non-selective tax collected and spent within the unit returns substantially dollar for dollar to the individual taxpayer. This is true because the money collected remains and circulates within the unit, and naturally distributes itself in accordance with the normal income distribution and, on the average, comes back into individual incomes in proportion to their size.

"Such a tax then can be raised or lowered with no disturbing effect on individual incomes. Moreover, such a tax remains non-selective when price changes occur, as in a depression, whereas selective taxes, such as those on real estate, become destructively selective at such times. This is because, under steady price



Col. E. S. W. Ragsdale told of the rubber-tired rail car. This is a section of the wheel showing the deflation ring

conditions, a tax on real estate or any other single class of property becomes evenly distributed in the course of a few years through automatic adjustments of rents, prices, interest rates and the like. If a marked change such as a serious drop in prices occur, the *relative* tax burden on real estate is suddenly increased in the same proportion. The tax therefore temporarily becomes highly selective, overburdening the owners of real estate. In the present depression, this form of taxation has become intolerable in some cases solely because of the *selective* character of the tax. This has arisen from the drastic change in prices and in general income distribution.

"The railroads present a sad picture of this kind. Railroad taxes built up in normal or prosperous times are high. So long as times remained normal, freight and passenger rates and general competitive conditions distributed these taxes with fair uniformity throughout the population and no great harm was done. In a depression, however, the railroads are left with reduced earnings and a highly selective tax burden which is destructive. Again, if all taxes were non-selective in the beginning, no such difficulty would arise through changes in price levels. We would emphasize again that any tax assessment, however *selective* it is to begin with, becomes distributed, automatically, generally throughout the population, through natural competitive processes but any marked change in price levels seriously disturbs this adjustment and makes trouble. If the assessment is non-selective to begin with, this difficulty does not occur.

"Another most important feature of non-selective taxation is that it may be used at times to the great *profit* of all taxpayers. If there are people unemployed, we have seen that the *reemployment of them adds to the total net income of the nation (State or*

city) from two to four times what they are paid in wages.

"Thus, if the nation, State or city, in times of unemployment will adopt a *non-selective tax* and use part of the proceeds in giving useful employment to people who otherwise are unemployed, the total net incomes will be increased by some such an amount. In effect, therefore, each taxpayer will receive again in income at least as much as he has paid in taxes plus a probable net profit of from 100 to 200 per cent, the community will have the benefit of whatever work is done and the man employed will have his normal wages.

F. F. Kishline carried the message of aluminum cylinder heads

"This statement will be difficult to accept because it is so contrary to fixed beliefs, but it is mathematically correct except for the size of the profit, which, however, is necessarily large.

"(3) *Capital Inflation.* When an inflation starts, as previously noted, it normally begins with an increase in the price of investments above their current earning power. This represents an *unearned increment.* This can be reinvested in capital at a normal interest rate only if business is increased enough to earn the added interest charge. The real value of capital does not increase in the absence of an increase in business, and the excess investment, in the aggregate, is a *total loss.* Worse than that, if allowed to go on it will cause an inflation resulting in much greater loss later on.

"This surplus, however, can be handled to the great advantage of its owners, as follows: If a sufficient portion of this surplus, as unearned increment, is diverted to consumables or social capital, the rest may be safely reinvested, since the first portion will increase business and the income from this increased business will yield the additional earnings necessary to permit payment of interest on the reinvested portion.

The Cure Must Be National

"It is evident that no single individual, nor even one entire industry, can by itself apply these principles, since the benefits would accrue to the whole nation at the expense of the individual in question. Only when the principle is nationally applied can benefits to *all* be assured and legislation by the National Government, or *concerted* action by the States or subdivisions thereof, offers the only means of making them effective.

"These devices offer a simple means of controlling most of the ills of capitalism without sacrificing any of its virtues."

It seemed to be the consensus of opinion of those present at the transportation and maintenance session which opened the convention Monday, that after T. R. Dahl had presented his paper on "Legislation Affecting Motor Vehicle Transportation," further activity in the marshalling of "facts" with which to combat adverse legislation was unnecessary.

Discussion naturally thereafter centered itself on the question of what could be done with the facts presented by Mr. Dahl, rather than on the paper itself. Mr. Dahl himself had suggested the introduction of bills in State legislatures calling for increased railroad taxation, elimination of grade crossings, increasing the visibility at grade crossings from safety considerations, etc. These bills could then be used by the automotive industry and transportation organizations for trading purposes with the railroad interests.

Mr. Dahl was in full accord with the conclusion that correlation of facts is not sufficient to combat adverse legislation introduced by railroads "as a smoke screen to hide their glaring inefficiencies." "We can't stop at the establishment of economic premises," Mr. Dahl said. "We must go beyond and get the public interest." Illustrating his contention of insincerity on the part of the railroads in this move, Mr. Dahl pointed out that the New Haven railroad carries normally one of the highest percentages of L.C.L. shipments, and thus meets more truck and bus competition than the average road. Yet the New Haven road has one of the best financial showings in the country.

"The motor vehicle operator is now being asked to pay for such gross inefficiencies on the part of the railroads," Mr. Dahl said, "as the loss by one railroad organization of twenty million dollars in the Waldorf-Astoria Hotel in New York City."

Merrill C. Horine, International Motor Co., A. J. Scaife, White Motor Company, and Pierre Schon, General Motors Truck Company, were in full accord with Mr. Dahl in his request for more publicity. Mr. Horine said such information especially should reach men in high places—in banks, insurance companies, etc. Figures were shown indicating that only a very small percentage of investments by trust and insurance companies is in railroad bonds—exploding a popular theory.

Mr. Schon felt however that railroad bonds were safe under any condition. "It is the stockholder who is going to be squeezed out eventually," Mr. Schon said, "just as he was in 1873, in 1893, and as he probably would have been in 1913 if it had not been for the World War."

Considerable discussion centers around the effectiveness or ineffectiveness of the Highway Users Conference in organizing to combat the railroads. It was generally felt that this conference as yet is not entirely effective.

Mr. Scaife made the point that publicity should be given to the fact that if motor truck operation is restricted, additional loads inevitably will have to fall on the pocketbook of the passenger car owner and operator, in the form of highway taxes of one kind or another.

High cost of indicators for high-speed engine study, the necessity of having a carefully

Athel F. Denham, field editor of Automotive Industries discussed low pressure tires

trained squad of men to handle them, their constant need for readjustment, etc., are among the causes for the lack of extensive use of such indicators by engine builders in this country, according to E. T. Vincent, Continental Aircraft Engine Company. He estimated that 95 per cent of engine builders are conducting experimental tests without any knowledge of what occurs within the combustion chamber.

H. W. Best of Yale University spoke at the Fuel and Lubricant sessions

"In the gasoline engines not quite the same urgent need exists for an indicator diagram as in the case of oil engines," Mr. Vincent stated. Continuing he said: "In the case of an oil engine prediction of the cycle in any shape or form, however, is impossible from a knowledge of compression pressure, rate of fuel supply and all the other factors shown in the drawing."

Mr. Vincent felt that the Farnboro electric indicator, which formed the subject of his paper, was the only one of the optical indicators capable of recording with a high degree of precision at all speeds and moreover suited to test-shop conditions.

In the discussion which followed the paper Mr. Vincent emphasized however that the Farnboro indicator was not a research instrument, but was particularly effective in locating unsatisfactory conditions within the engine and indicating the proper means of correction therefor.

He pointed out that the results obtained from the instrument do not depend to any great extent upon the operator, all that is required being the ability to close a switch and open an air valve in a slow and regular manner.

A plea for cooperative action between Diesel engine designers and fuel producers to establish standard ratings for oil engine fuels was again voiced in the second paper at the Diesel sessions, entitled "Fuels for High Speed Oil Engines," by Max Hoffman, Waukesha Motor Company.

This rating, according to Mr. Hoffman, should be similar to the octane rating adopted for carburetor fuels "to permit the engineer to judge whether a certain fuel will burn without objectionable combustion knock in a certain type of engine."

Yardstick Needed for Diesel Fuels

Mr. Hoffman emphasized that he was not asking for new fuels—only a yardstick by which to measure them. Such requests were expressed in the discussion, however, as well as a suggestion for standardizing of fuels in a manner similar to lubricating oils.

At the present time, Mr. Hoffman stated, specific gravity is most widely used as a guide to the suitability of engine fuels. He felt however that this property was entirely unsatisfactory in relation to knock

This latter factor, he agreed with H. R. Ricardo's findings, was due to the "delay period" after beginning of injection before beginning combustion. At high speeds this delay permits a greater amount of fuel to be injected before the beginning of the spontaneous combustion period, with a resultant high pressure rise. While Mr. Hoffman stated that this delay period could be reduced with increasing engine speed by correct dimensioning of intake valves and timing to increase volumetric efficiency and thereby the compression pressure and the temperature at the beginning of injection.

Of other physical properties, Mr. Hoffman listed flash point as having no meaning with regard to engine performance, viscosity while having some operating limitations producing no influence on the delay period of any fuel, volatility alone permitting no indication as to a fuel's behavior during ignition and combustion, and even spontaneous ignition temperature showing large variations possible for the same operating characteristics.

An interesting attempt to combine the advantages of both air and liquid cooling for aircraft engines was divulged for the first time publicly by J. H. Geisse, consulting engineer at the aircraft engine session Tuesday morning.

This development has its inception in the aeronautical laboratory of the Naval Aircraft Factory and was carried on by the Comet Engine Corp. under Mr. Geisse's supervision until the recent failure of this company.

Aircraft Engine Cooling System

Basically the engine cooling system might be referred to as sealed liquid cooling. Ethylene glycol is carried in a modified form of jacketing, with no forced circulation but a streamlining of the block proper and the use of cooling fins longitudinally of the block.

The powerplant was designed to have the following characteristics:

1. Reduction in total powerplant weight and increased reliability as compared with liquid cooling systems employing radiators.

2. A reduction in drag as compared with direct air cooling.

Experiments were carried on with both forced and thermosyphon circulation of the coolant, and with and without superchargers. Increase of operating temperatures were found to have only a small proportionate increase in oil cooling requirements. Supercharging beyond a power output corresponding to 126 B.M.-E.P. was found to have little effect in increasing liquid temperatures.

(Turn to page 153, please)

Max Hoffman pleaded for cooperation between designers and fuel producers

Just Among Ourselves

Hard Times and Bad Practice

ECONOMICALLY unsound business practices always hover about the fringe of buying and selling methods even in good times. As bad times prolong and intensify the fight for business existence these unsound practices tend to become more common and more acute.

Just as fair and honest individuals may be driven temporarily to personal acts against which his normal ethics revolt, so a business organization, fighting for its very existence, thinks less and less of the anti-social character of its acts and more and more of the immediate necessities. This always has been true and probably always will be until the millennium arrives.

But even in hard times, practices which are economically unsound, if continued long enough, tend to bring disaster even to the individual concern. The troubles arising from them eventually, even in bad times, finally may outweigh the temporary advantages which they have been designed to gain.

Price cutting and price chiseling very definitely are in this category. Buying and selling of automotive products at below-cost prices can't go on forever. Merchandising plans based on such buying eventually must fail.

And there is growing evidence that the bankers—still potent, though unpopular in industry—are going to look into buying and selling price policies as evidences of good or bad management to a greater extent than ever before. And certainly vendors, whose credit help may be needed in pinches, are going to look more kindly on those buyers whose business, if continued, will be profitable to them.

Selling below cost is in essence merely buying business with the vendor's capital. Financial interests are likely to look askance in the future at attempts to refinance enterprises whose merchandise has been sold primarily on that basis.

Mail Order Cars Again

New rumors and new denials of the marketing of an automobile by a mail order company have been greeted by many as though such an event would be a striking innovation in the annals of automobile selling. But Phil Smith, demon automotive historian, hastens to write us that it isn't any such thing. "Old timers," he says, "will recognize that it isn't a new-thing-under-the-sun for a mail order house to sell an automobile."

"Maybe you will recall," he continues, "the Sears Motor Buggy, a high-wheeled contraption offered to the public about 1910-1911-1912 by Sears, Roebuck. This creation was powered by a 2 cylinder engine of 14 hp. and came in three models—runabout, coupe and surrey.

"The price ranged from $375 to $485. You ordered it from the catalogue and it arrived disassembled, or, as they said in those days, knocked-down, in a crate."

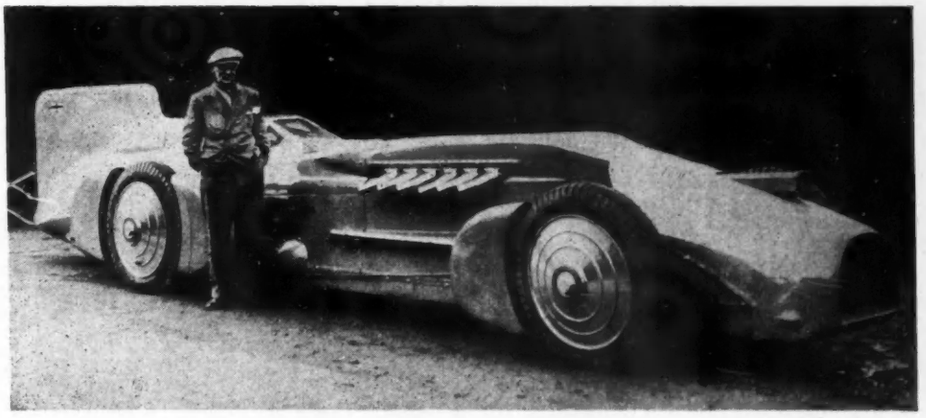
American Production and Administrators

AMERICANS are good production managers, but not as good administrators of industry, James D. Mooney, president of General Motors Export Corporation, told the Taylor Society and the Society of Industrial Engineers at the meeting at the Hotel Pennsylvania, New York, recently.

"We have gone aggressively into the erection and equipment of plants," he said, "without a very coherent idea of the fundamental relationship between these production facilities and the market they might serve to economic advantage.

"I, myself, have seen huge investments in plants, which, incidently, are now standing idle, where some factor, like the transportation cost of incoming materials, was the only one considered in the problem of plant location, and where no attention at all seems to have been given to the other important factors, such as the center of gravity of the market for the finished product, the quantity and character of the labor available, and the living costs in the area surrounding the location.

"We need an exploration of the implications of the economic extent of the market geographically, dependent upon the character and complexity of the product, the inert value of the product, and the amount of specialized pooling needed for its production."—N.G.S.



Capt. Malcolm Campbell with his reconstructed Blue Bird

280 m.p.h.

That's the top speed of the new 2350 hp. Blue Bird Campbell will use in attack on his own record

Blue Bird Features

Speed—280+ m.p.h. in high, 200 in second, and 100 in first.

Engine—V-12 with 6 in. bore and 6.6 in. stroke develops 2350 hp. at 3200 r.p.m. Supercharged.

Piston displacement, 2232 cu. in., giving output of 1.05 hp. per cu. in.

Weight is 1630 lb., or 0.694 lb. per hp.

Piston speed at 3200 r.p.m. is 3520 ft. per min.

Brake mean effective pressure—260 lb. per sq. in.

Fuel consumption—0.29 miles per U. S. gal.

Wheelbase is 164 in. and the overall length about 27 ft.

Weight—4½ tons, including 1500 lb. of lead carried over rear axle to give better traction.

Rear springs have different cambers so frame is tilted when car is standing still; torque reaction of huge engine levels frame at speed.

Tire tread 1/32 in. thick to reduce centrifugal force. Inflation pressure 120 lb. per sq. in.

Rear axle gear ratio—1.2 to 1. Tooth pressure on rear axle gears—6000 lb. per in. of face width.

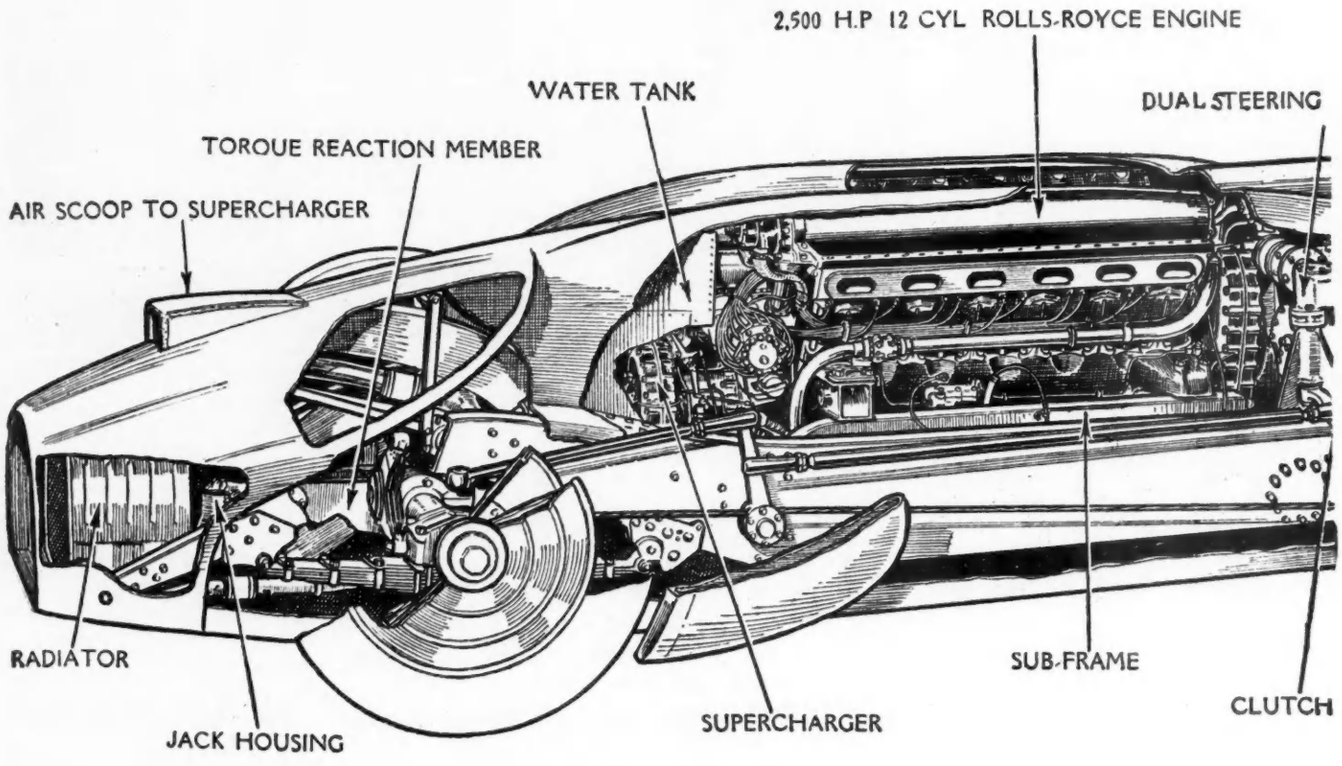
WITH 900 more "horses" under the hood of his revamped Blue Bird, Sir Malcolm Campbell is en route to Daytona Beach, Fla., to boost the new world's speed record of 253.93 m.p.h. which he set a year ago.

With its larger engine, Reid A. Railton, designer, estimates that the Blue Bird has the power to push the record up to 280 m.p.h.

For the interesting technical details presented here and for the cutaway sketch of the car on the two pages following, we are indebted to our contemporary, *British Motor*.

The car is basically the same as that which the present record was made, but it carries an engine of another make, of much greater horsepower, has been lengthened to accommodate this larger engine, and modified in many other respects, no doubt as a result of the lessons learned last year.

The new engine is a Rolls-Royce, with a nominal rating of 2500 hp., and is identical with the engine which won the Schneider trophy for England in 1931. It replaces the 1450 hp. Napier Lion engine with which the present record was established. The Rolls engine is a twelve-cylinder V water-cooled type, of 6 in.



bore and 6.6 in. stroke, which gives it a piston displacement of 2232 cu. in. It is said to develop 2350 hp. at 3200 r.p.m. and to weigh 1630 lb., which makes the specific output 1.05 hp. per cu. in. and the specific weight 0.694 lb. per hp. The piston speed at 3200 r.p.m. is 3520 ft. per min. and the b.m.e.p. corresponding to 2350 hp. at 3200 r.p.m. is 260 lb. per sq. in. Needless to say, the engine is supercharged, the supercharger being of the centrifugal blower type. Ignition current is furnished by two magnetos and engine lubrication is by castor oil.

Power is transmitted through a three-speed and reverse transmission of the constant-mesh type, and an indirect drive is used, the propeller shaft being offset from the crankshaft axis laterally to permit the driver to sit low in the chassis, alongside of the driving shaft, instead of above it. From the engine back the general arrangement of the mechanism has not been changed much, but owing to the greater overall length of the powerplant the chassis frame had to be lengthened. Important changes, moreover, were made in the outside form.

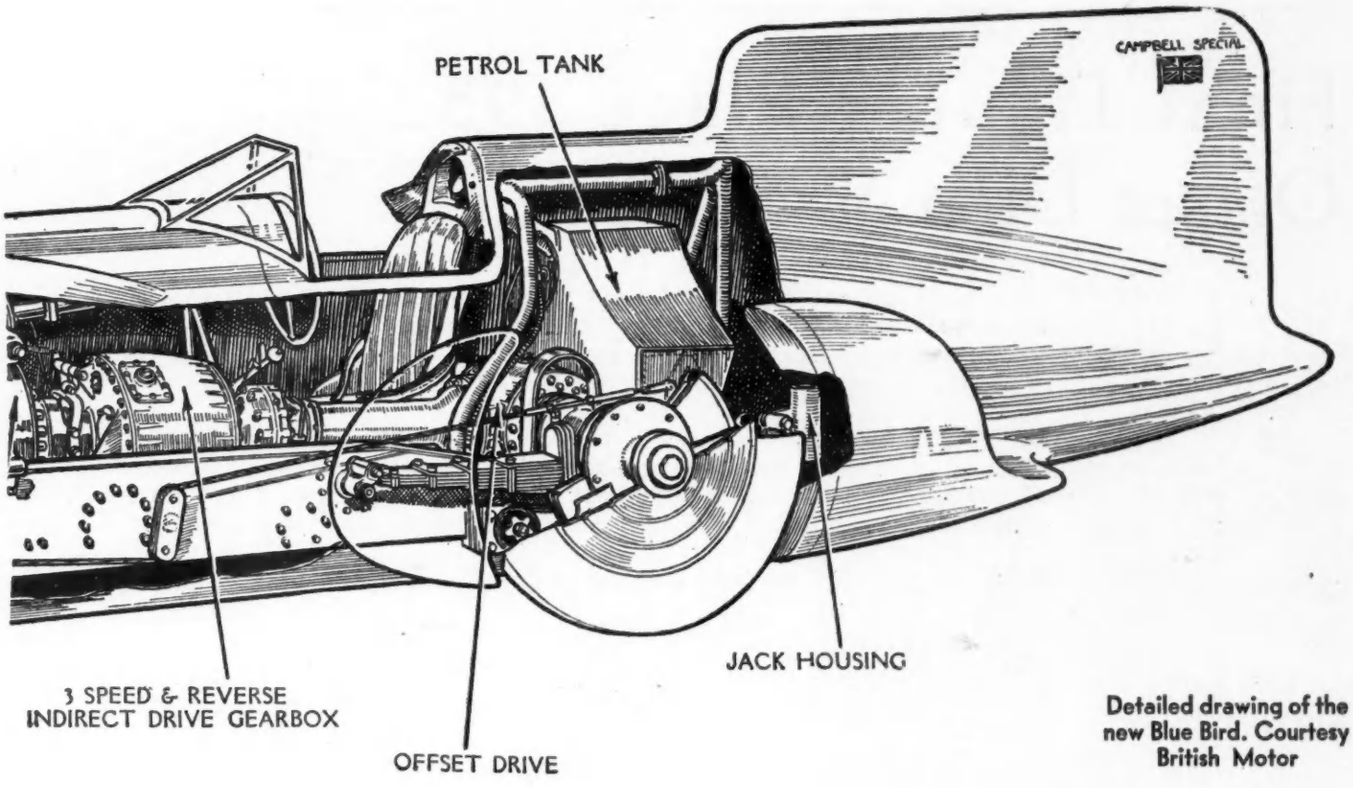
The radiator, instead of being carried on outriggers, is now mounted on extensions of the front spring horns, and the centrifugal blower takes in air through an opening well forward in the nose of the car. It is figured that the rush of air through this louver at high car speeds of itself adds 2 lb. per sq. in. to the supercharging pressure.

To take care of the braking torque on the front axle, the latter is provided with a torque member which permits its angular motion. It is mounted free in large diameter phosphor-bronze trunnions which carry the front springs. Brakes are applied by a vacuum servo.

With the lengthened frame, the wheelbase is now 164 in., the tread 60 in. at the rear and 63 in. at the front, and the overall length of the car approximately 27 ft. The total weight is in the neighborhood of 4½ tons. An interesting feature is incorporated in the rear springing to compensate for the effect of the driving torque. It is well known that the propeller shaft torque in any car tends to raise the frame on one side and depress it on the other; in a car with the tremendous power of this one, the effect, of course, is much more pronounced than ordinarily, and to prevent an unpleasant sideward inclination of the frame, the rear springs on opposite sides are given somewhat different cambers, so that while the frame is inclined with the car at a standstill, it will "level out" under full engine torque.

In the design of the body every effort naturally was made to reduce the maximum cross section as much as possible, as this determines the wind resistance to a considerable extent. The covers over the valves of the two banks of cylinders form part of the exterior surface, and between the two banks there is a depression through which the driver gets his view of the track ahead. Body paneling is of sheet aluminum, which is attached to the tubular and section framework by means of bolts.

An outstanding feature of the body, the same as last year, is the large fin at the rear. This, of course, corresponds to the tail surface of an airplane and is intended to keep the machine on a straight course. It is figured that if the car slewed around only slightly while at full speed, the tremendous pressure exerted by the wind on the then forwardly projected side of the fin would straighten it out again immediately. In the case of a side wind, of course, the big rear fin has a tendency to deflect the car from its course, as the wind pressure against the rear portion of the car will



Detailed drawing of the new Blue Bird. Courtesy British Motor

be much greater than that against the front portion. However, it is not likely that any record attempts will be made when the wind has any appreciable strength. It is stated, moreover, that not only the air pressure on the fin surface due to the speed of the car but also the gyroscopic effect on the front wheels tends to keep the car in a straight course. This gyroscopic effect at high speeds is expected to be so strong that should the car go into a skid the front wheels would not turn around with the frame but would continue to revolve in the same plane, causing the steering wheel to spin in the hands of the driver and producing a strong righting effect on the car.

Springing is said to involve no really difficult problems. To make the high speed necessary to break the record, the beach must be in perfect condition, as otherwise not sufficient traction would be obtained; and if the beach is perfectly smooth, there are no severe stresses on the springs even at very high speeds.

To guard against wheel tramp the wheels are very carefully balanced, and besides very powerful shock absorbers are fitted, which have a damping action on any tramping motion.

One of the most important problems in the design of a car for an attempt on the speed record is to secure sufficient traction. It is admitted that if money had been no object the whole car probably would have been redesigned for four-wheel drive. The sponsors of the undertaking did not want to go that far, and to assure the maximum traction with rear-wheel drive, the weight supported by the rear wheels had to be increased. To this end the tubular frame cross member at the rear is filled with lead, and lead is poured also into other members over the axle; in fact, the driver sits on an ingot of lead, his seat being located directly ahead of the axle. Altogether three-quarter ton of lead is used to load down the rear axle and add to its grip on the track.

It might be thought that something could have been done in connection with the formation of the tire tread to secure a better grip, but this is said to be impossible. On account of the tremendous centrifugal force on the tire tread, the latter must be kept as light as possible, or it will separate from the carcass. The tires actually used have a tread only 1/32 in. thick, and the tires are inflated to 120 lb. per sq. in. pressure.

Considerations of wind resistance naturally imposed limits on the size of the radiator core. The quantity of water carried is 30 gal., and two 1-in. pipes are provided to carry away any steam formed if the water should start to boil. The fuel capacity is 28 gal., which is just about enough for 10 miles or two runs over the course, including the stretches required for getting up speed and slowing down.

When in top gear the ratio between the crankshaft and the driving wheels is 1.2 and it is figured that the car can do 100 m.p.h. in low gear and 200 in intermediate gear without injury to the engine, though not for long, of course.

Transmission and drive parts are specially designed for the particular purpose and are very small in proportion to the power they will be called upon to transmit. On the teeth of the rear axle gears, for instance, there is a pressure of 6000 lb. per inch of space width. This would lead to overheating if the load were maintained for any length of time, but the entire running period, including acceleration and slowing down, is only a minute and a half, and much of the heat developed in the gearing during this period is taken care of by the thermal capacity of the metal. The brakes, too, are limited in size by the diameter of the wheels and are too small to be of value at really high speeds.

Final Figures Place 1932 Output Drop at 42 Per Cent

PRODUCTION of cars and trucks in the United States and Canada in 1932 was 42 per cent under 1931 according to final figures issued this week by the Department of Commerce which complete the volume record of the most dismal year in the industry's history. Output in 1932 was the smallest since 1918 when war curtailed production.

Although it will be impossible accurately to evaluate 1932 financial results for some weeks, it is not improbable that the combined net losses of vehicle manufacturers will exceed $100,000,000, or more than $70 per car produced. Dealer losses will raise the loss per car built and sold to $100 or more. The public certainly got bargains in 1932!

The production records for 1931 and 1932 follow:

	1931	1932	Per Cent Loss
Cars	2,038,183	1,186,259	—42
Trucks	434,176	247,247	—43
Total	2,472,359	1,433,506	—42

Sales in Canada and in other foreign markets declined slightly more than domestic business as the following table showing the distribution of production indicates:

	1931		1932		
	Units	Per Cent of Total	Units	Per Cent of Total	Per Cent Loss
Cars—					
Sales to U. S. Dealers	1,839,042	90.2	1,063,053	89.7	—42
Foreign Sales	199,141	9.8	123,206	10.3	—38
Trucks—					
Sales to U. S. Dealers	309,139	71.2	189,847	76.8	—39
Foreign Sales	125,037	28.8	57,400	23.2	—54
Cars and Trucks—					
Sales to U. S. Dealers	2,148,181	86.9	1,252,900	87.5	—42
Foreign Sales	324,178	13.1	180,606	12.5	—44

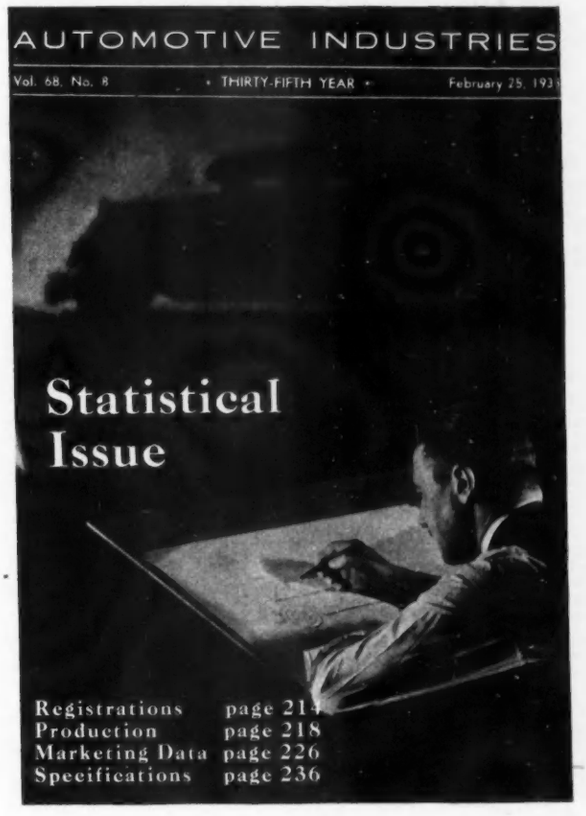
In the passenger car field, the low-medium price-class showed the smallest percentage loss from 1931 while those wholesaling between $1501 and $2000 sustained the largest decrease. A comparative classification of production on the basis of wholesale (factory sales) prices follows:

Per Cent of Total		Wholesale Price	Production		Per Cent
1931	1932	Class	1931	1932	Decrease
65.1	67.0	$500 and under	1,328,294	794,238	—40
20.3	22.0	$501-$750	413,929	260,968	—37
8.0	6.3	$751-$1,000	162,887	74,542	—53
4.0	3.1	$1,001-$1,500	80,687	36,601	—54
1.7	.7	$1,501-$2,000	33,913	8,699	—74
.9	.9	$200 and up	18,473	11,211	—39
100.0	100.0	Total	2,038,183	1,186,259	—42

A more complete comparative analysis of 1932 operations will be presented in the Annual Statistical Issue of Automotive Industries, out Feb. 25.

The Automotive World in Figures

by Marcus Ainsworth


AUTOMOTIVE INDUSTRIES
Vol. 68, No. 8 • THIRTY-FIFTH YEAR • February 25, 193
Statistical Issue
Registrations page 21
Production page 218
Marketing Data page 226
Specifications page 236

THE automotive industries' most valuable compilation of statistical and mechanical data will appear for the fourteenth consecutive year on Feb. 25, in the form of the Annual Statistical Issue of *Automotive Industries.*

Accurate, official figures on United States and World total registrations, new car registrations, market volume of parts and accessories in every market area on the globe have been augmented this year with additional break-down analyses.

Added to the complete mechanical specifications tables are larger and more complete tabulations of design features and details of automotive (high speed) Diesel engines, gathered from all important American and European manufacturers. The increasingly important part being played by the Diesel engine in automotive design makes this enlarged compilation of data extremely valuable, particularly at this time.

Scores of merchandising and engineering executives of the industry, both here and overseas, have contributed invaluable ideas all of which have in making the Statistical Issue the factual handbook of the industry. Car company statisticians, designing engineers and officials of the Federal Reserve and other banking institutions have been consulted in planning the work of compiling and editing the great mass of information this annual issue contains.

Improved tables of mechanical specifications of cars, trucks, engines, aircraft, buses and Diesel engines tell their stories of automotive development more quickly and more easily than ever before.

Figures on the dollar value and unit value of cars, trucks and automotive parts exported from the United States to the little-known ports of call of the seven seas and to the large markets of South America and Europe alike, have been compiled with great care and are edited to show totals by countries and continents.

Iraq, Ceylon and Haiti have each played a part, although a smaller one during 1932, in American automotive sales. These export data are given to give the merchandising executive an idea of the relative importance of each of these overseas markets.

New Allbestos Brake Lining Called King Pin

A new brake lining known as King Pin has been announced by the Allbestos Corp. It is a solidly woven lining in which are inserted numerous pins or plugs of a material known as leadite (vaporized lead) developed by the engineers of the corporation. It is claimed to have a low coefficient of friction, to be non-scoring, and not to melt and run out under the highest temperatures reached in brake service. In the formation of the plugs a pressure of 16,000 lb. p. sq. in. is applied to them, so that they suffer no further compression in service. Owing to the high heat conductivity of the leadite material the lining is said to remain comparatively cool in service, which in turn assures smooth action of the brakes.

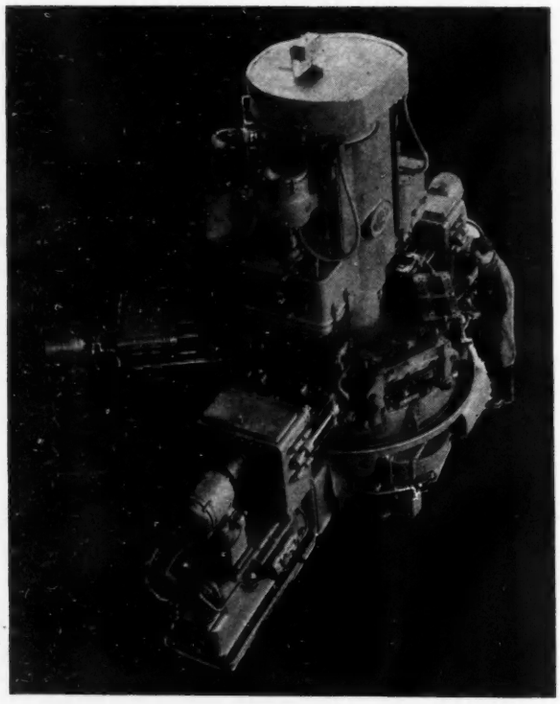


Fig. 1. Perspective view of Natco multiple head driller which takes care of 132 operations on the Plymouth cylinder block.

Chrysler

Puts millions in new equipment to squeeze last nickel out of costs so that buyers would be sure to "Look at All Three"

WHEN Walter P. Chrysler announced his broad equipment program to the industry last fall, it was difficult to visualize from a distance what these millions of dollars spent in this direction really achieved.

Then, just prior to the preview of the 1933 Plymouth, Paul C. Sauerbrey, vice-president in charge manufacturing, was kind enough to take us through the Plymouth plant where startling changes were being wrought. Here was a plant considered the last word several years ago in an industry that led all others in mass production. Yet with a bold stroke it was completely dismantled—yes, cleaned out.

Its orderly production lines, its smoothly functioning machine shops, even its vaunted system of conveyors, were ripped out to make way for a new order.

Their place is taken by marvelous machine tools so new that they were described only recently in the Production Issue of *Automotive Industries*. That is, not all of them, because the details of some are still to be made public. A simpler, more modern system of coordinated materials handling has been fitted to the new layout. A different paint shop and the last word in automatic chrome plating departments will greet those who visit this factory for the first time.

Chrysler surely chose the psychological time to make the change. The outlay of capital expenditure at this time makes his move a shining example of the very philosophy that motivates the activity of the group of fighters behind the Committee of Industrial Rehabilitation.

The factory organization at Plymouth has accomplished the job of harnessing a unique group of high-speed, highly productive machines carefully selected for the problems ahead. This has yielded increased productivity, has released floor space for new activi-

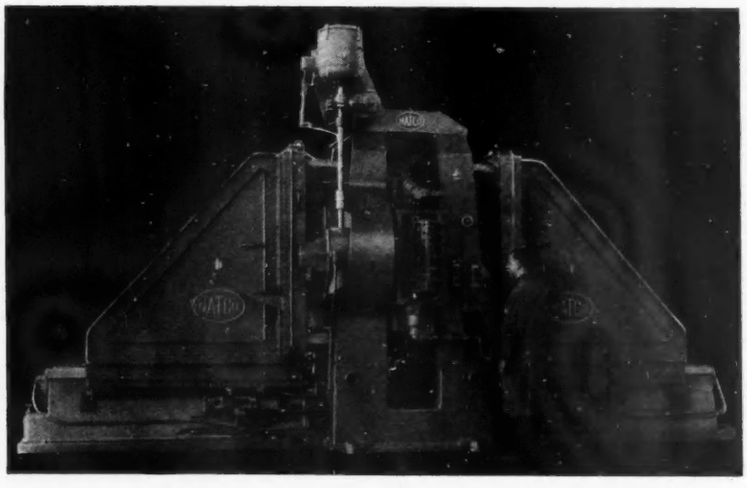


Fig. 2. Drum type Natco handling 18 operations drilling, facing, counterboring, etc., the distributor shaft hole. Note how the block is held at the required angle so that tools are in normal position.

"Shoots the Works" in New Plymouth Plant

By Joseph Geschelin
Engineering Editor,
Automotive Industries

Fig. 3. Two-way, three-head Natco for core drilling, semi-finish and finish-boring crank and cam holes. It produces two finished blocks at a time, working on six while the operator loads two more.

ties by throwing out less efficient equipment.

Many equipment makers and machine tool builders contributed to this development. Obviously, the thing is too big to be covered with any degree of detail in even a large group of articles. So we have selected just a few high spots in the engine line in the hope that these may provide an appreciation of the plant as a whole.

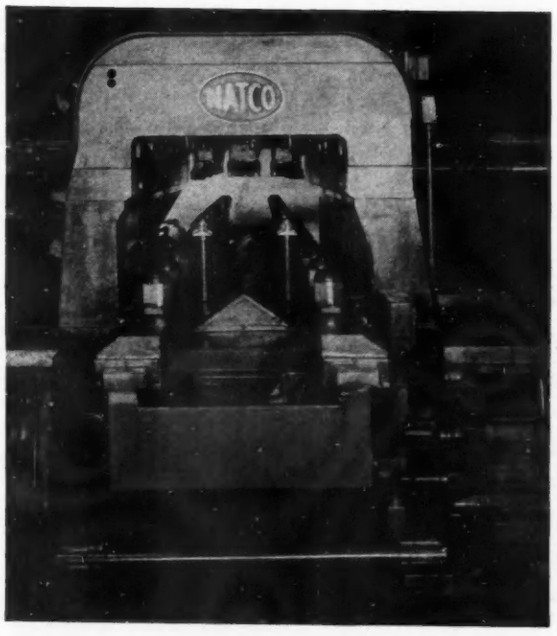


Fig. 4. Intimate close-up of the elevating mechanism which lifts the blocks into position on the fixture, leaving the conveyor free to go back for more work. This is a special feature of the Natco machine shown in Fig. 3.

Towering above other machines in the plant is the Natco driller shown in interesting perspective in Fig. 1. It is a new station type multiple head, multiple spindle driller having four vertical and four horizontal heads. It is semi-automatic in operation, being operated hydraulically.

The machine performs 132 operations in drilling, core drilling and countersinking various holes in the block. There are six stations, four working, one loading and unloading and one idle. One block is finished with each cycle of the machine.

Fig. 2 shows a Natco drum type combination drilling, counterboring, facing, chamfering, countersinking and tapping machine for handling 18 operations on the distributor shaft hole. The machine is a two-way, four-head combination with a five position trunnion-type fixture. One block is finished at a time. As indicated, the block is held at the proper angle in the fixture so that the spindles may work in the normal plane.

Tapping heads are driven by a single reversing motor drive unit, each spindle being equipped with an individual lead screw to insure the correct lead on each tap. The two large units which handle most of the operations are semi-automatic with hydraulic feed. The machine weighs about 50,000 lb. Production about 76 blocks per hour.

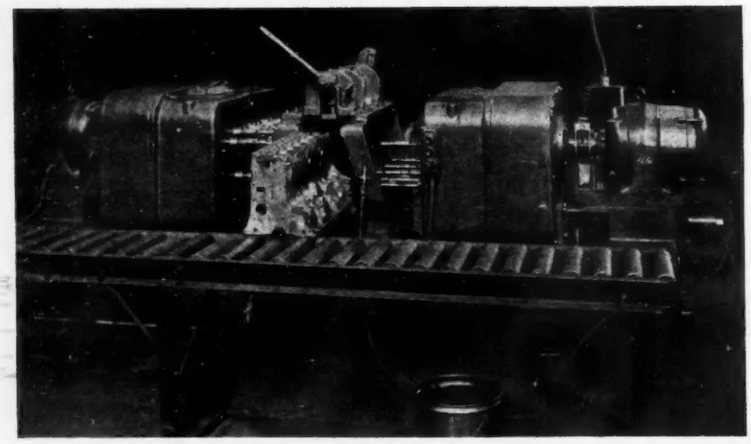
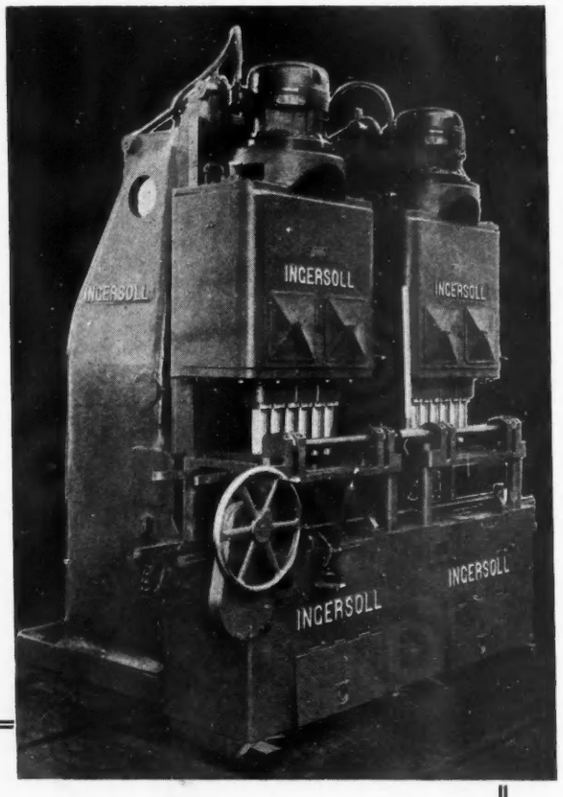


Fig. 5. (Left) One of three Greenlee two-way, horizontal screw feed tappers. This set-up takes care of 29 holes producing 75 blocks per hour.

Fig. 6 (Below) Twin battery of Ingersoll boring machines used to semi-finish and finish-bore the cylinders. This is one of the first boring machines especially designed for utilizing cemented carbide tools.



Natco has installed another machine, Fig. 3, a two-way, three-head boring machine for core drilling, semi-finish and finish boring crank and cam holes. It produces two blocks at a time, working on eight blocks while the operator loads two.

The feature of this machine is an internal automatic conveyor, Fig. 4, operated hydraulically, which carries the blocks to their proper stations and elevates them in place off the conveyor. While the heads are completing their cycles, the conveyor returns to the loading station where two more blocks are loaded by the operator. The whole thing is controlled by a single push-button with reach of the operator. Production is about 90 pieces per hour with one operator.

Greenlee has three two-way horizontal screw feed multiple spindle head tappers in the line. One of these takes care of 21 holes in the top, 33 in the bottom; another taps six holes in the rear end, 17 in the front end. The third machine, typical of the rest, is shown in Fig. 5. It has a 9-spindle head for tapping holes in the water jacket side, a 20-spindle head for the manifold side. Production from this machine is 75 blocks per hour.

Two 6-spindle Ingersoll Cylinder Boring Machines are used to semi-finish and finish-bore the cylinders. Both are installed in the production line as one unit as shown in Fig. 6. They are thought to be one of the first cylinder boring machines especially built for use with cemented tungsten carbide tools. Three outstanding features are claimed for these machines:

1. They are the highest production cylinder boring machines ever built, guaranteed to produce 75 semi-finished bored and 75 finish-bored cylinder blocks every hour.
2. Guaranteed to semi-finish and finish-bore within 0.0005 in. of round, with not more than 0.0005 in. taper, square with the crank line within 0.0015 in. in length of bore, and to size within 0.001 in. total tolerance.
3. Boring saddles are so constructed that the spindles may be relocated to take care of possible changes in the center dis-

132 holes drilled in Plymouth cylinder block in one setting.

18 operations on distributor shaft hole performed in 48 sec.

Cylinders finish-bored within 0.0005 in. of round; not more than 0.0005 in. taper.

10 rods per minute ground to thickness on 20-station Blanchard grinder

Hydraulic feed adaptors solve problems of drilling oil hole in crankshaft.

Internal automatic conveyor serves core drilling operations on cam and crank bores.

tances of the cylinder bores easily and economically.

One of the current line of drillers by Foote-Burt is found in Fig. 7. It has a hydraulic feed and its function is to drill all holes in the top and ends of the block. Production is 90 blocks per hour.

It is no secret that the new Plymouth boasts of inserted exhaust valve seats formed by pressing in a hardened alloy insert. Faced with the more serious problem of valve seating, the Plymouth organization has installed a group of high-speed Hall eccentric valve seat grinders seen in part in Fig. 8.

These grind both the intake and exhaust valve seats using three heads at a time as shown. For extreme accuracy, the grinding wheel is guided by a stationary pilot inserted in the valve stem hole.

The block reaches the first operator with pilots inserted in the six intake guides; the first man grinds three intakes and slides the block along to a second operator who completes the other three. The block then goes to a checking operator who inspects, removes the pilots, fits them in the six exhaust valve guides and passes the job to a line of two triple set-ups where the hardened seats are finished in two steps.

Perhaps one of the most vexing operations in the manufacture of crankshafts, that of drilling the diagonal oil holes ¼ x 4¾ in. deep, seems to be thoroughly licked by the application of hydraulically operated adapter units recently placed on the market by Leland-Gifford. These units, providing a step-by-step feeding cycle for the drill were installed on twelve standard hand feed machines.

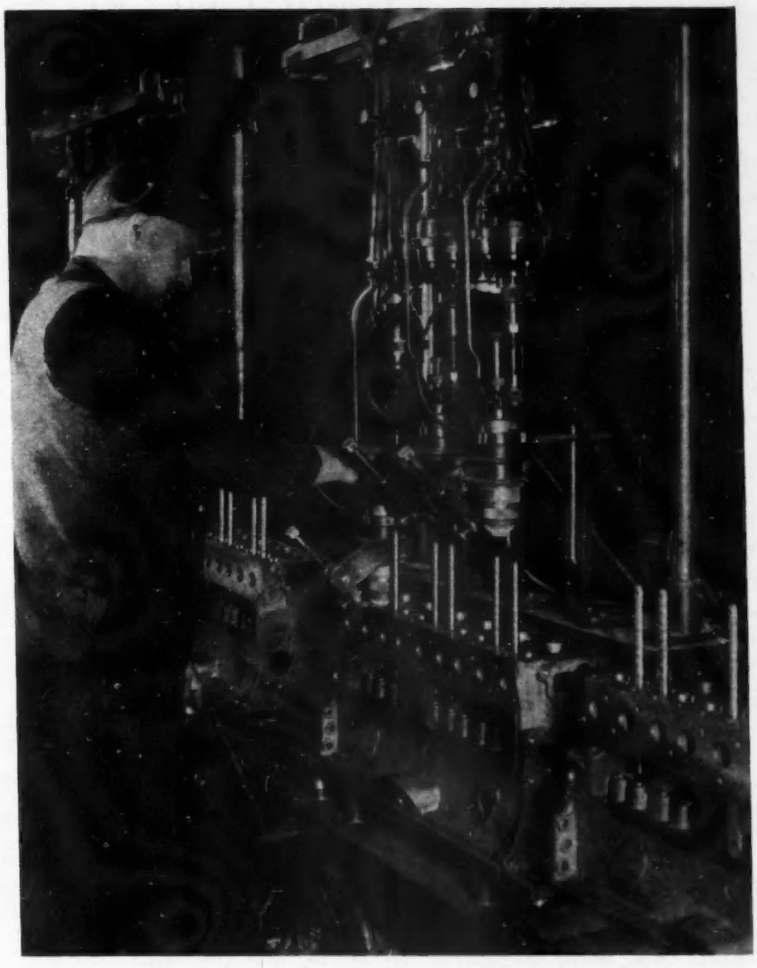


Fig. 8. Grinding inserted valve seats with the new high speed Hall-Toledo eccentric grinding heads. The wheel is accurately guided by pilots inserted in the valve stem guides.

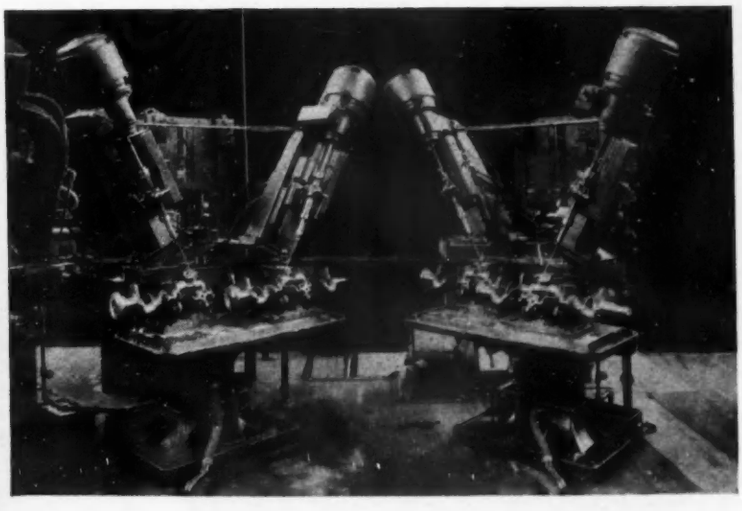


Fig. 9. One pair of a battery of crankshaft drilling machines equipped with the Leland-Gifford Step-by-step hydraulic feed. This attachment has solved the problem of productivity and drill maintenance on this job.

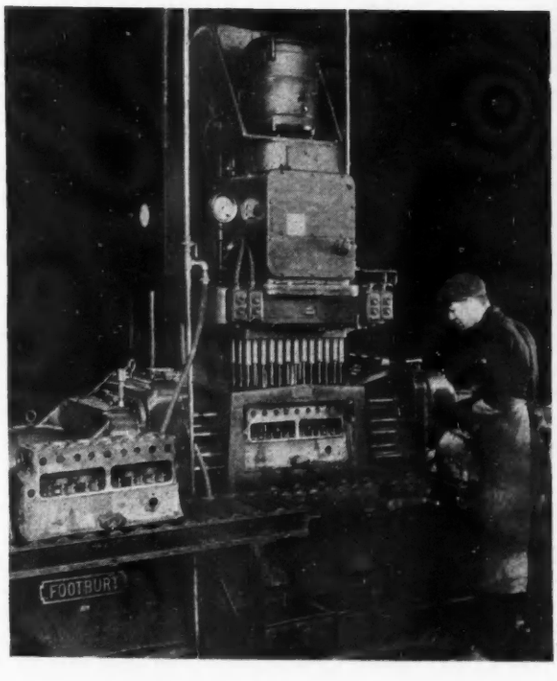


Fig. 7. (Left) Foote-Burt multiple head driller for drilling top and ends of block. Production 90 per hour.

The arrangement of these machines is of great interest. Fig. 9 shows one pair in one row, revealing in close-up that the machines of each pair are set at 90 deg. There are two rows of three pairs each; an operator runs two pairs facing each other on each side of the aisle thus forming a square. Each square works on the same operation on four crankshafts, i. e., four machines are drilling pins 1 and 6, four others are drilling 2 and 5, while the remaining battery drills 3 and 4.

Some idea of the advance in the art of grinding may be gained from the work done by Blanchard automatic grinders on the connecting rod. Three separate operations are performed:

The first, after forging and coining, is to grind one side of the rod on a Blanchard No. 16-A automatic surface grinder, Fig. 10, removing about 1/32 in. stock from both ends of the rod. This makes the two ends flat and in the same plane so that subsequent machining operations can register from these surfaces. A 20-station fixture mounted on the rotary table holds the rods and automatically clamps and unclamps. The production is 480 to 600 rods per hour from one machine, ground to a definite thickness.

The second operation is to grind the joint faces of rod and cap on a Blanchard No. 16-A2 two-spindle automatic surface grinder, Fig. 11. This machine has two wheels, one for roughing and one for finishing, under which the work passes in succession.

The fixture holds 12 rods and 12 caps. The rod is dropped down over two pins entering the bolt holes while a hardened plunger moves out into the piston pin hole. A clamp arm then comes down into the big end of the rod to hold it down firmly. One pass of the work under the wheels removes 0.012 in. stock with the first wheel and 0.003 in. stock with the second wheel. The work is held to +0.002 in. and the production is 400 rods and 400 caps per hour from one machine.

After assembling, the rods and caps are ready for grinding the sides of the big end on another two-spindle Blanchard grinder. A 24-station fixture is used with 12 stations for the first side, and 12 stations with locating pads 0.015 in. higher for the other side. The rod is supported on three points and automatically clamped. A total of 0.015 in. stock is removed from each side, about 0.003 in. of this being removed by the finishing wheel. The thickness of the rod end is held automatically to +0.0005 in. and an excellent finish is obtained at a production rate of 400 rods or 800 surfaces per hour.

Fig. 10. Blanchard automatic surface grinder removing about 1/32 in. stock from both ends of the connecting rod. They get an output of 480 to 600 rods per hour with a 20-station rotary fixture.

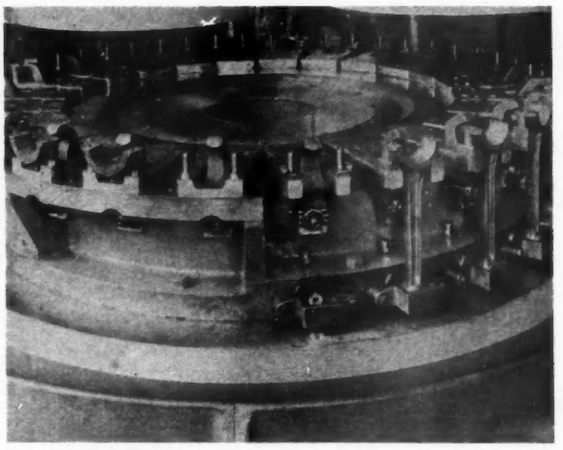


Fig. 11. Finishing the joint faces of both the rod and cap on a two-spindle Blanchard which roughs and finishes in one pass of the table. Production 400 rods and 400 caps per hour from one machine.

The foregoing is but a glimpse of the many interesting machines and processes harnessed to build Chrysler products at prices that fit today's pocketbooks. The machines described here have been selected at random as a sample of the whole scheme. There is much more that the visitor may see in a trip through the plant.

Now, more than ever, can the Plymouth factory be characterized as one of the most modern to be found anywhere in the automobile world.

New Front-Drive Car in Germany

A NEW front-drive passenger car of luxurious design has been placed on the German market by the Nationale Automobil Gesellschaft. It is equipped with an eight-cylinder V engine of 3.34 3.94 in. cylinders (227 cu. in.), which develops about 100 hp. The car has independent springing at front and rear. Drive to the front axle is by worm and wheel. The steering heads are connected to channel sections extending along the sides of the engine and forward, by a wishbone-type of radius rod at the top, while at the bottom there is a half-elliptic inverted spring which is clipped to the differential housing at the center and connected by spring bolts to the two steering heads. The wishbone type of link, of course, takes care of the driving thrust.

Instead of a pressed-steel frame, a tubular backbone is used. At the rear there are two half elliptic springs mounted side by side on top of the tube and in addition there are two rigid links extending from the bottom of the tube to the stub axle. The front brakes are in the wheels.

PATS PRODS and PREDICTIONS

from the S. A. E. ANNUAL MEETING

We should get nowhere
in science or engineering if problems were handled in the manner in which economic problems have always been handled. Progress in science has always been based upon the simple statement and use of basic laws. No such laws, with perhaps one exception, are generally recognized in economics.—*H. C. Dickinson, president of the S. A. E.*

* * *

We live and drive
our motor vehicles around at the bottom of an ocean of air. . . . The day is coming when we shall drive streamlined cars and marvel at their beauty. —*W. E. Lay, University of Michigan.*

* * *

I feel that
the highly special high-production, multiple-operation equipment is like the investment type of banking, making large profits in boom times but becoming badly frozen and highly expensive in times of low production or rapid change.—*J. E. Padgett, Spicer Mfg. Co.*

* * *

But standardization
. . . . has gone into a fog of "super-standardization" that threatens not only to obscure the character of individual manufacturers themselves, but to block successful progress in the industry as a whole.—*W. T. Fishleigh, Consulting Engineer.*

* * *

It seems to me
inconceivable that we shall ever sell any great number of airplanes until we produce them with clear unobstructed vision forward for the operator. A plane that must be zigzagged down the field to enable the pilot to look for obstancles in his path may serve for an industry in its swaddling clothes, but, now that we are putting on short pants, it has no place.—*J. H. Geisse, Consulting Engineer.*

* * *

In freight traffic,
one ton of gondola carries three tons of coal; in the passenger end, which has been a dead loss for years, two tons of train carry one passenger.—*E. J. W. Ragsdale, Edward G. Budd Mfg. Co.*

* * *

How much of riding discomfort
is caused by spring forces that cannot be controlled by shock-absorbers is rarely realized.—*C. H. Kindl, Delco Products Corp.*

With this greater attention
to comfort, manufacturers have come face to face with the need for measuring this comfort.—*F. A. Moss, George Washington University.*

* * *

The time has come
When Diesel designers and fuel producers must cooperate to produce a standard rating for oil engine fuels.—*Max Hofmann, Waukesha Motor Co.*

* * *

The present day car
is needlessly, even absurdly low. This phase of construction might be called "low-down" engineering, one of the lowest forms.—*Herbert Chase, Automotive Daily News.*

* * *

It is too much
to say that "comfort appeal" has as yet kept many manufacturers awake.—*F. R. Atkinson, F. R. Atkinson Spring Co.*

* * *

There has been a great deal
of development work in the clutch field in the last few years, the result of which may introduce a fifth epoch in clutches and force us to learn another new set of A, B, C's as applied to the clutch art.—*E. E. Wemp, Long Mfg. Co.*

* * *

If the public wants
automatic transmissions, they will appear as standard equipment. I believe that a good automatic transmission will appeal to the American public. One company is now preparing to offer an automatic transmission at retail for 10 modern cars. . . . —*Walter C. Keys, Consulting Engineer.*

* * *

Perhaps a better picture
(of the electromagnetic spectrum) would be obtained if we represented the wave length of the shortest known cosmic rays by a length of 1 in. On the same scale the longest radio waves then would cover a distance reaching from the earth to a point 100 times the distance from the earth to the sun.—*Harvey C. Renschler, Westinghouse Lamp Co.*

* * *

There is no question
that the use of an accurate indicator will disclose in a few minutes information that may require weeks of experimentation and the expenditure of hundreds of dollars to determine without its use.—*E. T. Vincent, Continental Motors Corp.*

Automotive Oddities—By Pete Keenan

MARIE SINCLAIR HAS HER CAR SPECIALLY WINTERED EACH YEAR TO REACH HER CAMP IN THE ADIRONDACK MOUNTAINS
DR LYTLE ADAMS, NOTED DESIGNER, HAS INVENTED THIS SYSTEM OF PARKING PLANES UP-ENDED THUS SAVING ABOUT 50% FLOOR SPACE.
THE EARLY AUTO'S WERE EQUIPPED WITH WHIP SOCKETS.
STOP
IN N.S. WALES AND VICTORIA, AUSTRALIA, TAIL LIGHTS MUST BE CONTROLLED ONLY BY A SWITCH AT THE LIGHT ITSELF.
INDIANS USED TO SKIM OIL FROM THE SURFACE OF STREAMS IN THE PENNSYLVANIA OIL COUNTRY AND SELL IT AS A VALUABLE MEDICINE.

Write us if you know an Oddity

Rolls-Royce Condor Aircraft Engine Converted to Diesel Type

ABOUT a year ago it was reported that development work was under way in England whereby a Rolls-Royce Condor aircraft engine was converted to a Diesel type engine, the engineering staff of the Royal Aircraft Establishment at Farnborough cooperating with the staff of the Rolls-Royce firm in the work. It is now reported that ground tests of this engine have been completed and that it has gone successfully through the 50-hour type test of the Air Ministry. Flight tests of the engine have been begun, a Hawker Horsley plane being used for the purpose. This is the first Diesel engine to complete the 50-hour type test of the Air Ministry, with the exception of the Beardmore Tornado engine designed for the R-101, which, however, was of somewhat heavier construction, to meet the requirements of airship service.

It is pointed out that in developing Diesel engines for aircraft work in the past, it has been the usual practice to increase the strength of parts considerably over that provided in gasoline-typed aircraft engines, in anticipation of greatly increased stresses. In the development of the Condor oil engine the reverse procedure was followed, in that a normal gasoline engine was started with and an effort made to determine how much strengthening was necessary in order to enable the engine to pass the 50-hour test for Diesel engines.

The Rolls-Royce Condor engine is a twelve-cylinder V, water-cooled engine of 5½ in. bore and 7½ in. stroke, and as a Diesel engine it operates with a volummetric compression ration of 12.5 to 1. The maximum combustion pressure is 800 lb. per sq. in. The power developed at the normal speed of operation is 480 hp. at 1900 r.p.m., and a maximum of 500 hp. is obtainable at this speed. With starter and accessories but without propeller hub the engine weighs 1504 lb., so its specific weight is 3 lb. per hp. The two banks of cylinders of the engine make an angle of 60 deg. with each other, so explosions occur at uniform intervals.

NEWS

Briggs Resumes Body Deliveries to Ford

Ford Plant Opening and New Model Announcement Dates Still Indefinite

DETROIT, Feb. 1—Deliveries of Ford bodies by the Briggs Mfg. Co. were resumed today. According to Briggs officials its employees now number 3000 and they are having no difficulty securing additional workers.

Early resumption at the Ford plants is now being forecast although the exact reopening date continues as uncertain as a week ago when the shutdown became effective.

The Briggs company now looks for a resumption of volume production within a few days. Operations at the Murray plant, it is reported, will be resumed as soon as Briggs gets under way.

Meanwhile nothing regarding the announcement of new Ford models, originally reported to be scheduled for this week, has been forthcoming. It is understood, however, that a suffi-

(Turn to page 148, please)

Work-Sharing Gives 4000 Jobs at Goodyear

AKRON, Jan. 31—The operation of the winter Share-the-Work plan in the Akron factories of the B. F. Goodrich Company since Oct. 1 has resulted in the retention or the recall of approximately 500 workers, according to T. G. Graham, vice-president.

"Since Goodrich began its general program of spreading work throughout the entire organization, it is estimated that on present weekly schedules a total of 4000 have been held in employment," Mr. Graham said.

Hupp Gives Buyers 12 Free Service Coupons

DETROIT, Jan. 30—A coupon book entitling the owner to 12 free service lubrications and courtesy inspections is being delivered with each new Hupmobile. These coupons will be accepted in the service station of any Hupp distributor or dealer in the United States or Canada, and are good at any time during the two years following the date of delivery. Distributors and dealers are reimbursed for the work done on receipt of the used coupons by the Hupp factory.

A.C.F.-Brill Service & Sales Are Merged

George Frey Will Head Combined Activities

NEW YORK, Feb. 1—William H. Woodin, president, The Brill Corporation, announced today that, effective Feb. 1, 1933, all sales and service activities of the A.C.F. Motors Company will be coordinated with those of The J. G. Brill Company, Philadelphia, both of which are subsidiaries of The Brill Corporation.

Under this new plan of operation, all matters pertaining to the sale and servicing of A.C.F. motor coaches will be consolidated with the sales and service organization of The J. G. Brill Company, under the direction of George Frey.

Philadelphia Jobbers Vote "No" on Clinic

PHILADELPHIA, Feb. 1—No maintenance clinic will be held here this year. The group of jobbers who have staged annual clinics in this city for several years past today voted unanimously not to go through with the exhibition this spring.

Peerless Suit Quashed

CLEVELAND, Jan. 30—Proceedings in a stockholders' receivership and accounting suit against the Peerless Motor Car Corp. have been quashed by the Common Pleas Court. The court upheld the corporation's contention that it was without jurisdiction since Peerless is a Virginia corporation.

N.S.P.A. Slates Parts Congress for Chicago

DETROIT, Feb. 1—A National Parts Congress, under the sponsorship of the National Standard Parts Association, will be held in the Stevens Hotel, Chicago, early in November.

The schedule of events during the Congress provides for a two-day N.S.P.A. convention session, to be followed by the five-day exhibition in which N.S.P.A. manufacturer members and Motor & Equipment Manufacturers' Association members will, as usual, be eligible to participate.

In the interest of economy the exhibition will be completely housed in the Stevens Hotel exhibition hall and grand ball room.

This will permit all activities coincident with the Congress to be carried on within the one building.

Manufacturers have been enthusiastic in their approval of the restriction of exhibition space and the many inevitable economies resulting therefrom, according to the N.S.P.A. Ten-foot square booths of one, two or three spaces will be allowed exhibitors, based on the type of product as well as the amount of space used in previous years.

As at the Detroit Show in 1932, the wholesaler attendance will be open during the early portion of the show to N.S.P.A. and M.E.W.A. members only; being open later for several days to invited non-member wholesaler guests.

No Pillars in New DeSoto Foursome

Newest Body Style Carries $925 List

DETROIT, Jan. 31—DeSoto Motor Corp. has announced the introduction, coincident with the Chicago automobile show, of an entirely new and different body type called the DeSoto Foursome.

The four-place sedan is a "pillarless" automobile, the door pillars having been eliminated. DeSoto is the first American manufacturer to introduce this feature, although the type has been popular for several years on expensive European custom-built cars. List price is $925.

The doors are unusually large, being six inches wider than usual, providing an exceptional degree of unobstructed vision. Doors lock both top and bottom. The interior is finished in leather up to the belt.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, Feb. 1—Retail trade was moderately better in some sections of the country last week, despite the abnormally high temperatures. General business, however, was quiet pending developments regarding some important economic questions now before Congress. Collections for the country as a whole remained slow, although there was a slight improvement in New York.

DECEMBER INDEX ABOVE NOVEMBER

The Guaranty Trust Co.'s index of business activity for December stood at 58.7, as against 58.3 for the preceding month and 68.6 for a year ago. The company's index of wholesale commodtiy prices on Jan. 15 was 33.5, as against 33.9 a month earlier and 43.1 a year ago.

FREIGHT SHIPMENTS DROP

Railway freight loadings during the week ended Jan. 21 totaled 496,434 cars, which marks a decrease of 9888 cars below those during the preceding week, a decrease of 65,667 cars below those a year ago, and a decrease of 219,040 cars below those two years ago.

DEPARTMENT STORE SALES

Department store sales in the metropolitan area of New York during the first half of January were 22.7 per cent below those in the corresponding period last year.

The level of employment during December in 17 major industrial groups in the United States, according to the Bureau of Labor Statistics, declined 0.4 per cent, while the total payrolls declined 0.9 per cent. Increased employment was reported in four of the groups and higher payroll totals in three of them.

COTTON MILLS PRODUCTION

There were 31,442,174 cotton spinning spindles in place at the end of December, of which 23,775,136 were operated at some time during the month, as against 24,349,506 during November and 24,688,094 a year ago.

FISHER'S INDEX LOWER

Prof. Fisher's index of wholesale commodity prices for the week ended Jan. 28 stood at 55.5, as against 56.4 the week before and 57.3 two weeks before.

BANK DEBITS BELOW LAST YEAR

Bank debits to individual accounts outside of New York City during the week ended Jan. 25 were 18 per cent below those a year ago.

STOCK MARKET QUIET

There was little activity on the stock market last week. Price fluctuations moved within a narrow range, and net changes for the week were irregular and small.

FEDERAL RESERVE BANKS

The consolidated statement of the Federal Reserve banks for the week ended Jan. 25 showed decreases of $1,000,000 in holdings of bills bought in the open market and of $15,000,000 in holdings of Government securities. Holdings of discounted bills increased $16,000,000. The reserve ratio on Jan. 25 was 65.4 per cent, as against 64.7 per cent a week earlier and 64.1 per cent two weeks earlier.

C.I.T. to Retire First Preferred

NEW YORK, Jan. 30—Commercial Investment Trust plans to retire all outstanding preferred stock at $110 plus quarterly dividend due April 1, 1933. Cash now in the treasury will be used for the purpose. On Dec. 31, 1932, there was outstanding $4,422,100 of the 6½ per cent first preferred and $3,657,500 of the 7 per cent first preferred. Retirement of 66,459 shares of common now held in the treasury also is contemplated. The plan has the approval of the directors and will be voted upon by the stockholders at a special meeting called for March 14.

Dividends on the preferred stock which it is planned to retire amount to $564,791.50.

Exide to Receive Big Tax Refund

PHILADELPHIA, Feb. 1—The Electric Storage Co. will benefit to the extent of $1,416,566 by decision rendered by the United States Court of Appeals. The amount involved represents special taxes and interest paid by the storage battery company. The court denied the right of the Treasury Department to levy the 5 per cent tax applicable to automotive accessories on commodities usable both in automobiles and for other purposes.

Studebaker Sells 4500 in January

SOUTH BEND, IND., Feb. 1—Sales to dealers of Studebaker and Rockne cars during January amounted to 4500 as compared with 5000 in the same month last year. January sales of Pierce-Arrow cars were 240.

Quarterly dividends of $1.75 on the preferred stock of the Studebaker Corp., which are due at this time, have been omitted.

Jenkins Suspended

WASHINGTON, D. C., Feb. 1—Ab. Jenkins has been suspended by the Contest Board of the American Automobile Association for one year for driving a Pierce-Arrow roadster in an unsanctioned event on the salt beds of Utah.

N.S.P.A. Elects Seven

DETROIT, Feb. 1—The election of six wholesalers and one manufacturer to membership in the National Standard Parts Association is announced by E. P. Chalfant, executive vice-president.

The newly elected members are: Hartford Piston Service, Inc., Youngstown; Parts Service Corp., Montgomery, Ala.; Precision Machine & Foundry, Ltd., Calgary, Alta.; Saginaw Service Parts Co., Saginaw; United Wholesalers, Sioux City, Iowa; Ver Wys & Co., Grand Rapids, and McAleer Manufacturing Co., Detroit.

Cord Corp. Reports Net of $1,523,503

CHICAGO, Jan. 30—Cord Corp. reports net profit of $1,523,503, equal to 67 cents a share, for the fiscal year ending Nov. 30, 1932, against $582,788, or 26 cents a share, in the 1931 fiscal year.

The balance sheet shows a current ratio of 24 to 1, current liabilities amounting to $391,765. Cash and government securities total $7,544,995. The operating statement includes an item of $1,897,392, profit from trading in securities.

Tests Show Rotating Wing Design Sound

Platt's Radical Plane Analyzed by N.A.C.A.

NEW YORK, Jan. 30—At the first meeting of the newly formed Institute of Aeronautical Sciences at Columbia University, Haviland H. Platt, chief engineer of the Wilkening Mfg. Co. of Philadelphia, told of experiments conducted by him as early as 1927 on revolving-wing airplanes similar to that on which Dr. Adolf Rohrbach of Berlin is now working. The plane in question, it may be recalled, has revolving wings comprising a number of adjustable-pitch vanes and does not require a propeller.

Mr. Platt said he had interested Government aviation officials in the plan during the early part of 1927, and, at their suggestion, a small model with a single pair of wings was tested in the M.I.T. wind tunnel in the fall of that year. While the tests were inconclusive, they were distinctly encouraging, and the next step was to build a larger and more complete model on which experiments were carried out at Guggenheim School of Aeronautics, New York University, throughout 1929 and 1930. These tests, Mr. Platt said, indicated definitely that the design meets all the requirements of a practical and satisfactory vertical-lift machine, including lift per horsepower, speed in forward flight, simplicity in operation, and the ability to land safely in an emergency in either a vertical or inclined path.

Dr. G. W. Lewis, director of Aeronautical Research, N.A.C.A., said a theoretical analysis had shown that this craft would make it possible to take off and land vertically, and that in the event of engine failure, owing to autorotation of the wings, the machine could make a safe landing in a restricted space.

Trucks Serve Farmers Better than Railroads

Highway Shipments Form 36 Per Cent of Total in 1932 Dept. of Agriculture Finds

WASHINGTON, Jan. 30 — Motor trucks are hauling an increasing volume of farm products, according to reports of field representatives of the Bureau of Agricultural Economics, U. S. Department of Agriculture.

In the East, the situation is most observable in the many truckloads of Florida citrus fruits that are being retailed by truckmen-peddlers along the highways from North Carolina to Massachusetts. Carlot receivers, wholesalers, and retailers of farm produce in practically all markets are complaining of the truck competition.

The bureau's market news representative at Chicago has reported that "truck receipts are becoming an important factor in the Chicago potato market, and local carlot receivers are inclined to view the situation with some alarm, as it is cutting in on their business." In one day, recently, 30 carloads of potatoes reached Chicago in motor trucks, principally from Michigan and Wisconsin.

"This stock," the bureau's representative continues, "is delivered to the jobbers' stores at about five cents per hundredweight less than the local carlot price. Taking into consideration the five cents per hundredweight drayage cost, it means that jobbers are able to buy trucked-in stock at about ten cents per hundredweight less than carlots on track. Fully 75 per cent of the trucking is by growers and by small truckers with headquarters in producing areas.

"Unemployment," he concludes, "has no doubt contributed materially to the huge increases in truck movement, but the swing has been increasing rapidly each year, both as to tonnage and length of hauls."

Bureau records show that of the total fruit and vegetable receipts in eight large markets during the first 11 months of 1932, 36 per cent came by truck, compared with 29 per cent in 1931 and 25 per cent in 1930.

Many growers say they favor motor truck marketing because it affords a direct method of shipment from farm to store door or customer, often at less cost than rail shipments; it saves time on short and medium-distance hauls, making it possible to get the product to the consumer in fresh condition; it enlarges marketing outlets and finds new customers; it reduces packing expense; it decreases marketing risks by encouraging cash sales at the farm.

Louis Rogge

Louis Rogge, vice-president and treasurer of the Dayton Wire Wheel Co., died recently in Macon, Ga.

Dodge Sales Higher

DETROIT, Jan. 31—For the week ending Jan. 21, retail deliveries by Dodge dealers of Dodge and Plymouth passenger cars and Dodge trucks were 12.7 per cent greater than deliveries during the preceding week, which itself marked up a 10.3 per cent rise in deliveries. The retail volume of the week covered by the report also exceeded that of the corresponding weeks of 1932 and 1931.

Even Greeks Find Days Odd

Greek autos with even tag numbers operate only on certain week-days and odd-numbered vehicles take the streets on other days under a new Governmental ruling, according to a report to the Commerce Department's Automotive Division from Assistant Commercial Attache Ralph Curren, Athens.

This action was taken by the Government in order to reduce imports of gasoline into Greece, which in 1931 amounted to about 50,000 metric tons. All classes of passenger cars and privately-owned automobiles are affected by the decree, but not ambulances or cars owned by members of the diplomatic corps or used by the various government departments.

December Output Gains 78 Per Cent on November

WASHINGTON, D. C., Feb. 1—December production of cars and trucks in the United States and Canada was 109,542 against 61,760 in November, a 78.3 per cent gain, and 123,973 in December, 1931, the Department of Commerce reports.

Of the December output, 107,403 were produced in the United States and 2139 in Canada.

Combined December passenger car production for the two countries totaled 87,760 including 291 taxicabs, while truck production amounted to 21,782.

Empire Content Rule Satisfies Canadians

TORONTO, Jan. 31—The British Board of Trade ruling requiring 50 per cent Empire content to qualify for imperial, is to be satisfactory to Canadian automobile manufacturers. In fact this rate was suggested by the Canadian factories at the time of the Ottawa Imperial Economic Conference.

Five Companies Share War Dept. Plane Orders

WASHINGTON, D. C., Jan. 30—War Department orders placed for new airplanes recently total $3,880,000 and cover 170 new planes and equipment. Among the orders are one to the Glenn L. Martin Co. for 38 ships valued at $2,070,889. The Boeing Airplane Co., Seattle, received an order for single seater, low-winged pursuit planes with supercharged air-cooled engines, valued at $201,117. Bellanca Aircraft Corp. got an order for ten single seated cargo transports amounting to $275,651. An order to the Douglas Aircraft Co. covered 15 observation planes, and amounted to $174,613. Twenty-eight Hornet engines valued at $157,729 were ordered from the Pratt & Whitney Aircraft Co.

House Votes to Keep Gas Tax Another Year

Industry's Opposition Fails to Block Action

WASHINGTON, D. C., Jan. 30—Continuance of the Federal one cent tax on gasoline to June 30, 1934, was approved by the House of Representatives today without a record vote. The united opposition of automobile manufacturing, petroleum, motoring and agricultural interests were insufficient to kill this discriminatory method of raising cash which Uncle Sam needs so badly. The bill now goes to the Senate where its fate is uncertain even if that body gets around to it before the end of the short session.

Opposition to a continuance of the discriminatory Federal gasoline tax was registered by the National Automobile Chamber of Commerce in a brief presented by Pyke Johnson, vice-president, to the House Ways and Means Committee.

The brief said that the automotive industry is opposed in principle to discriminatory taxation. He also pointed out that the 24,000,000 motor vehicle owners are already subjected not simply to double but to treble and quadruple taxation.

"In a period such as the present, every item of tax expense added to the operating costs of the owner tends to restrict use and so further limits the market for new cars," the brief continues. "The industry has reduced both initial and operating cost of its product in every direction, but we cannot overcome the arbitrary barriers of taxation without the help of Congress and the legislatures. A general public interest in opposition to the invasion of the Federal Government into the gasoline tax field is found in its effect upon state gasoline tax revenues and state highway bond issues."

DeSoto Retail Sales Are Double Last Year

DETROIT, Jan. 31—For the fifth successive week, automobile deliveries by DeSoto dealers showed a gain of more than 100 per cent over the corresponding week of last year, the factory announced today. Deliveries for the week ended January 21 totaled 965 cars as compared with 348 for that week of last year. This was also a gain over the previous week of this year when 859 cars were delivered.

Stewart-Warner Reports

CHICAGO, Jan. 30—A deficit of $2,445,197 for the year ending Dec. 31, 1932, is indicated in a preliminary report issued by the Stewart-Warner Corp. This compares with a 1931 deficit of $1,830,171.

Timken Appoints

The Timken Steel and Tube Company wish to announce the appointment of Delaware Steel Service, Inc., with general offices and warehouse at 1614 Summer St., Philadelphia, Pa., as their exclusive representatives in the Philadelphia District.

New Reo ¾-Ton Delivery

DETROIT, Jan. 30—Reo Motor Car Company has announced a new light delivery Speed Wagon unit powered by a Gold Crown engine. It is to be known as the Reo 1500-pound light special delivery.

Church Leaves White

CLEVELAND, Jan. 30—H. D. Church has resigned as vice-president in charge of engineering of the White Motor Co.

Twin Coach Active

CLEVELAND, Jan. 30—The Twin Coach Co. is reported to be operating six days a week with a force of between 350 and 400 men.

Automotive Markets Shrink Sharply When Gas Tax Exceeds Three Cents

NEW YORK, Feb. 1—Gasoline consumption falls sharply and automobile sales slump in those states where gasoline taxes are advanced above the 2 and 3-cent levels, it is shown in percentage tables compiled by Fred Van Covern, director of the statistical department of the American Petroleum Institute.

In every instance the declines were heaviest in the states where the tax on gasoline is highest, and the declines were more abrupt when the tax increased above 3 cents.

Declines in the three classifications by state groups were as follows:

Gas Tax Rate Cts.	No. of States	1932 Per Cent Decrease from 1931 Gasoline Consumption	New Car Sales	Motor Vehicle Registrations
7	2	—14.5%	—47.4%	—14.3%
6	6	—11.2	—44.5	—13.1
5	8	— 8.9*	—46.0*	— 2.0*
4	17	— 9.1	—43.0	— 6.9
3	12	— 4.9	—42.0	— 5.5
2	3**	— 3.5	—39.7	— 3.6

*Returns for three states not available.
**and the District of Columbia.

Briggs Resumes Deliveries

(Continued from page 145)

cient bank of cars has been built prior to the shutdown, to permit sampling dealers.

Charges that certain of his competitors with the backing of certain banks were responsible for the shutdown which a London newspaper credited Mr. Ford with making in a transatlantic telephone interview, injected an element of melodrama into the situation.

Subsequently Mr. Ford was quoted as saying: "We'll have to have bodies, even if we have to make them ourselves. We will wait, however, to see whether the Briggs company will be able to settle its trouble with its own men."

Spokesmen for the Briggs employees, whose strike is now dragging through the second week, say that working conditions and compensation were responsible for the walkout. On the other hand, Briggs officials say that the trouble arose over the question of pay for dead time which tended to be large due to unavoidable delays incident to getting into production on new models.

To eliminate this cause of friction, base rates starting at a minimum of 25 cents per hour for unskilled labor, are now in effect which assure a minimum hourly wage regardless of piece rate earnings. The strikers are reported to be holding out for hourly minimums of 50 cents for men and 45 cents for women as well as for recognition of shop committees.

The number of men involved in the Briggs strike is placed at 6000. At the Murray plant, which shutdown simultaneously with Ford, about 4500 men were employed. Clarence W. Avery, Murray president denied that his employees were on strike except for about 100 tool and die makers. The Ford suspension resulted in the layoff of 40,000 men here and 60,000 elsewhere in the country.

Besides Ford, Briggs numbers among its customers several Chrysler divisions and Hudson. Other Murray customers include Lincoln, Hupp, Hudson, Graham, Packard and Rockne.

Although the Briggs strike is one of the largest industrial disturbances of the depression, so far it has proceeded without violence.

Motor Stock Values Gain 3.1% in January

	Dec. 31, 1932 (000's omitted)	Jan. 31, 1933 (000's omitted)	Increase (000's omitted)	Per Cent Increase
15 Rails	$1,088,240	$1,187,181	$98,941	9.0%
10 Utilities	1,771,255	1,688,573	82,682*	4.6*
14 Industrials	624,576	667,015	42,439	6.7
10 Oils	1,762,679	1,703,517	59,162*	3.3*
7 Mines	338,268	340,607	2,339	0.6
7 Motors	738,358	761,330	22,972	3.1
5 Steels	321,085	326,691	5,606	1.7
5 Equipments	129,649	155,470	25,821	19.9
5 Electricals	557,785	563,331	5,546	1.0
5 Chemicals	457,522	470,196	12,674	2.7
7 Foods	583,363	579,784	3,579*	0.6*
5 Merchandise	578,768	553,614	25,154*	4.3*
5 Amusements	115,507	97,965	17,542*	15.1*
Totals	$9,067,062	$9,095,274	$28,217	0.3%

* Decrease.

(Courtesy Frazier, Jelke & Co.)

Studebaker to Pay Salesmen $200,000

SOUTH BEND, IND., Feb. 1—Studebaker is continuing the Master Salesmen's club plan which enabled hundreds of their retail salesmen to earn extra money in 1932 to carry them through the seasonally low months of winter, President Paul G. Hoffman of the Studebaker Sales Corp. of America announces. The membership in the club will total about 2500 and, if present sales objectives are attained, approximately $200,000 will be paid members when the year is ended.

The bonus money will be paid in three equal installments on Dec. 15, 1933, and on Jan. 15 and Feb. 15, 1934.

MacDonald I.M.A. President

FLINT, MICH., Jan. 30—K. J. MacDonald, assistant treasurer of the Buick Motor Co., has been made president of the Industrial Mutual Association.

All Industry Products Hit by Contest Ruling

WASHINGTON, Feb. 2—A cable from the London office of the Department of Commerce indicates all automotive products are included in the mandate of the British Board of Trade ruling increasing to 50 per cent the empire content of labor and (or) materials entering the United Kingdom in order to get advantage of the British preferential tariff granted British dominions.

The ruling becomes effective April 1, and applies to the United Kingdom only.

The general interpretation here is that the ruling is only a formality growing out of the agreement reached at the Ottawa conference. Otherwise it is difficult to understand its issuance at this particular time when Great Britain and the United States are about to enter upon debt negotiations in which Great Britain expects sharp concessions in return for which President-elect Roosevelt likewise hopes for British tariff concessions, which now appear unlikely.

Truck Carrier Rate Regulation and Size-Weight Limits Split Rail-Highway Group

Committee Agrees that Permission of Regulatory Authority to Operate as Interstate or Intrastate Common or Contract Carrier Be Required

NEW YORK, Jan. 30—Only on rate regulation of motor truck carriers and on the limitations to be placed on the sizes and weights of motor vehicles did the members of the Joint Committee of Railroad Executives and Highway Users fail to get together. Full agreement was reached on taxation, reciprocity, coordination of highway administrations, grade crossing separation and the necessity for motor carrier regulation, the committee's report shows. The report will be transmitted to the National Transportation Committee of which the late Calvin Coolidge was chairman.

Rate regulation of common carrier buses was accepted by both elements in the committee, but the highway users accepted rate regulation of common and contract carrier trucks, "if and when sufficient data have been collected to indicate the desirability of such regulation in public interest."

On size and weight limitations the highway users contended for the standards adopted by the American Association of State Highway Officials and the U. S. Bureau of Public Roads. The railroads on the other hand declined to recommend any uniform standards, believing that weights and lengths are matters that should be left to the individual states.

Both elements on the committee agreed that common carriers of persons and/or property in both interstate and intrastate commerce should be required to secure certificates of convenience and necessity, in the first case from the Interstate Commerce Commission and in the second from the state regulatory authority. Among other things, in granting certificates, it was agreed that the regulatory authority should consider the adequacy of present service and the effect of the proposed service on existing agencies. Financial responsibility of the carrier would be required, qualifications and hours of service of drivers would be regulated, and the keeping of proper accounts required. It was agreed also that the rights of carriers in operation prior to the passage of the regulatory law should be protected by a "grandfather" clause.

It also was agreed that contract carriers in both interstate and intrastate should be required to secure permits and that the qualifications and hours of service of drivers should be regulated; that they keep records and reports required by the regulatory authority, and that they show financial responsibility.

Opportunity should be given rail carriers to engage in highway service on equal terms with others and that they should have the right to purchase lines then in operation as well as to establish new lines, the committee concluded. Necessary modifications of the anti-trust laws should be made for this purpose.

On the subject of taxation, the committee was in agreement that motor vehicles should pay all state highway costs and a proper proportion of the costs of other highways in the state. In addition to gasoline taxes, passenger cars, the committee agreed, should pay a registration fee graduated according to weight or horsepower; buses in for-hire service should pay a registration fee based on mileage operated and graduated according to seating capacity; trucks should pay a registration fee graduated that it will increase more than directly with weight. All such taxes should be used exclusively for highways and none should be diverted to other purposes.

Steel Output Rate Maintains Up-Trend

Prices in Metal Markets Hold Steady — Rise in Copper Prices Probable

NEW YORK, Feb. 2—The picture of the steel industry as a whole was changed very little as the result of what postponements of deliveries were temporarily made necessary by the labor difficulties at the Briggs body plant and their effect on Ford operations. The rate of operations of sheet and strip plants, catering at this time almost solely to automotive consumers, was well maintained this week.

As has been the case for some time, there continues to be considerable seesawing in the activities in the different steel districts. Cleveland which had been setting the pace for other districts is now beginning to register somewhat slower progress, while nearby Youngstown and Pittsburgh mills experience somewhat quickened activities.

More than ever it is being recognized that estimates of the rate of steel operations on a percentage basis of 67,000,000 tons annually, when the actual capacity after writing off obsolescent units is more nearly 55,000,000 tons, yields more confusion than information. With some mills operating fully three-fourths of their capacity and others less than one-third, it is idle to present an estimate of percentage averages to convey an approximate average picture of mill activities.

Taking it all in all, the trend toward more satisfying volume continues and considerable progress was made in January toward the reestablishment of sufficient volume tonnage to bring back into sight, what one steel company official referred to a few days ago as the "profit-making zone." Prices for sheets and strip have suffered no further sinking spell and the market otherwise is fairly steady.

Pig Iron—Automotive foundries continue to call for fair-sized tonnages of foundry and malleable irons. Quotably there have been no changes in any of the markets.

Aluminum—Professor Colin G. Fink, of Columbia University, told the American Institute of Electrical Engineers at its annual Winter convention that there was every indication that by 1942 the world's output of aluminum would total 600,000 tons—the equivalent in volume of the world's copper output in 1929. The market is unchanged.

Copper—London cables predict decreases in production in non-American copper producing countries from now on with the probability of rising prices "unless there should be an outbreak of liquidation from some American source." Domestic consumers have taken on a few carloads for prompt shipment at 5 cents per pound, delivered Connecticut Valley.

Tin—With more favorable end-of-January statistics looked for this week, the market has turned firmer, the week's opening price for prompt Straits being 23.10 cents.

Lead—Steady and unchanged.

Zinc—Quiet.

Studebaker Has New Line of Four Trucks

Vehicle Gross Weight Rating Plan Adopted

SOUTH BEND, Jan. 25—Studebaker Corporation has just announced its new line of trucks, which ranges in capacity from 1½ tons to 3-4 tons and includes an additional model of 1¾-2½ tons rating. The corporation has introduced a new system of rating, the rating applied to any particular model varying with the roads, loads and operating conditions. Included in the new line are the following:

Model S-2 (1½ to 2 tons), with a vehicle gross weight of 8000 to 9000 lb., listing at from $670 to $745; the new Model S-4 (1¾ to 2½ tons), with a vehicle gross weight from 9000 to 10,500 lb., at $785 to $865; Model S-6 (2 to 3 tons), with a vehicle gross weight from 10,500 to 12,000 lb., at $945 to $995, and Model S-8 (3 to 4 tons), with 14,000 to 16,000 lb. vehicle gross weight, at $1350 to $1425.

The new trucks all are equipped with the Studebaker 230 cu. in. engine which develops 75 hp. at 3200 r.p.m. All driving axles are of the full-floating type, with straddle-mounted pinions. Auxiliary springs are standard equipment on all except the 1½-ton chassis. Brakes are of the two-shoe, duo-servo type controlled by cable and operating against drums of nickel cast iron, and in all except the 1½-ton chassis they are operated by B-K power units.

In designing the new trucks, the item of appearance has received special attention. Radiator, front bumper and fenders convey an impression of massiveness. By providing a skirt which extends from the cab down to the step and running board, it is possible to mount the battery on the outside of the frame, where it is readily accessible and at the same time fully protected from the weather. Instruments of the airplane type, including a speedometer, an engine-temperature indicator, an electric gasoline gage, an oil-pressure indicator and an ammeter, are mounted on the dash.

Granvilles, Chandler and Hurlburt Form Plane Co.

SPRINGFIELD, MASS., Jan. 30—Alfred D. Chandler of Guyencourt, Del., and William B. Hurlburt of New York, formerly treasurer and vice-president, respectively, of Bellanca Aircraft Corporation, have joined the Granville brothers in forming a new concern called the Granville Aircraft Corp. to succeed Granville Bros. Aircraft Corp., and will manufacture a new line of planes for commercial passenger use. Mr. Hurlburt was a pioneer manufacturer of motor trucks at Bridgeport, Conn., before and during the World War.

Zantford D. Granville is president of the new concern, Mr. Hurlburt is vice-president, and Mr. Chandler is secretary and treasurer. Manufacturing operations will be increased by the addition of about 50 employees. Sales will be carried on through a New York office.

LePage Specializing On Transport "Giros"

PHILADELPHIA, Jan. 30—W. Laurence LePage, formerly vice-president and chief engineer of the Kellett Autogiro Corporation, has resigned to undertake independent work in autogiro development. Mr. LePage has been associated with the autogiro picture since Harold Pitcairn brought the first autogiro to America in 1928. With the cooperation of the Autogiro Company of America he is devoting his whole time to the design and construction of large transport autogiros.

Diesel Engines Make Debut at Berlin Show

Eight American Makers Will Exhibit 1933 Cars

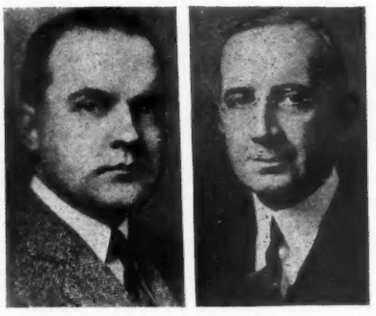
BERLIN, Jan. 18. (By Mail)—The international automobile show, to be held here Feb. 11-23, will include 13 German and 14 foreign makers of passenger cars, 15 German and 5 foreign makers of motor transport vehicles, 4 German and 1 foreign proprietary engine makers, 12 German and 1 foreign body builders, 14 German and 2 foreign motorcycle works, 193 German and 2 foreign exhibitors of components, machinery, etc.

Numerous new "baby" cars and cyclecars will make their appearance. Daimler-Benz have brought out for this show three further models with independent wheel springing, similar to the 100 cu. in. car of last year. One of these cars, which has an engine of 230 cu. in. piston displacement, is equipped with a supercharger. The N. A. G. Company is at last coming out with its long-promised front-wheel drive model with engine having horizontally opposed cylinders.

There will be at least seven makes of Diesel engines of German origin at the show, besides the Swiss Saurer. A very interesting feature will be a Michel Diesel engine of 60 b.h.p. output, said to be suitable for passenger cars, as it weighs only 6½ lb. per b.h.p. and runs smoothly. Junkers and Büssing-NAG each have three models of Diesel engines from 40 to 110 b.h.p.

The M. A. N. Company has developed a new 70 b.h.p. Diesel engine and will show it in a chassis with welded frame in which rivets are wholly eliminated. This company will also show a 100 b.h.p. Diesel engine with a welded steel structure. Welding is claimed to effect a considerable saving in weight. Krupp, having acquired a manufacturing license for the Junkers two-stroke Diesel, is bringing a number of chassis fitted with these engines.

Ford, Lincoln, Cadillac, Packard, Buick, Hudson, Chrysler and Chevrolet are taking part in the Berlin show.



D. E. Ahrens and R. L. Newton, Cadillac assistant sales managers, whose appointments as heads of newly created western and eastern sales areas respectively was reported last week

New Condors In Test Hops

NEW YORK, Jan. 24—The new 15-passenger Curtiss-Wright 1933 Condor bi-plane will undergo test flights over St. Louis early in February, according to R. S. Damon, president of Curtiss-Wright Airplane Co.

A summary of the performance data and characteristics of the new Condor is as follows:

Length, overall, 48 ft. 10 in.
Height, overall, 16 ft. 1 in.
Wing span, 82 ft.
Climb at sea level, 850 ft. per minute
Service ceiling, 15,500 ft.
Absolute ceiling, 17,500 ft.
Top speed, 170 MPH
Cruising speed, 145 MPH
Range at cruising speed, 560 miles
Gasoline capacity, 300 gallons
Power plants, 2—700 horsepower R-1820F Wright Cyclones.

Carries 15 passengers, 2 pilots, 450 lb. of baggage and express and 200 lb. of mail, a total payload of 3200 lb.

G.M. Employment In Four-Month Rise

NEW YORK, Jan. 30—For the fourth consecutive month the General Motors Corp. reports an increase in the number of its employees. The December gain was 12,642 and the total gain for the four months was 26,376. The increased employment is due primarily to the seasonal influences, but the gains were larger than the same four months of 1931.

Would Bar Trucks Where Rails Serve

CHICAGO, Jan. 30—General application of the ruling of the Illinois Commerce Commission in the case of the Keeshin Motor Express Co., if upheld, would make possible the prohibition of the operation of common carrier motor vehicles in territories shown to be adequately served by existing rail and express facilities. In making the ruling, the Commission agreed with the contention of the railroads that the Keeshin Company, which started as a contract carrier and later worked into the common carrier class, should be denied permission to operate in certain territories except where other transportation facilities are insufficient.

Morgan Head A.C.C.A.

NEW YORK, Jan. 30—Thomas A. Morgan, president of the Curtiss-Wright Corp. and North American Aviation, Inc., has been elected president of the Aeronautical Chamber of Commerce of America. He succeeds Charles L. Lawrence.

Tax Levies Force Par Value Changes

NEW YORK, Jan. 30 — Thirteen companies in or allied with the automotive industry changed the par value of their stocks in 1932, according to a study made by the New York *Times*. The companies included follow:

Norwalk Tire, common $10 to no par and preferred $100 to $50.
Continental Diamond Fibre, no par to $5.
Mengel, no par to $1.
Aviation Corp., no par to $5.
Curtiss-Wright, no par to $1.
Lee Rubber & Tire, no par to $5.
Murray Corp., no par to $10.
Checker Cab Mfg., no par to $5.
Graham-Paige, no par to $1.
Chrysler, no par to $5.
Bendix Aviation, no par to $5.
Reo Motor Car, $10 to $5.

Among other reasons for many of these changes is the desire to reduce taxes on stock franchises and transfers.

Drescher Heads Sales

Norman W. Drescher, vice-president of Valentine & Co. for many years, head of the Trade Sales Division of the company, has been elected vice-president of the Detroit Graphite Co., a Valentine affiliate, covering the industrial field.

In his new assignment, Mr. Drescher will have general supervision over all sales and advertising activities of the Detroit Graphite Co. as well as Valentine & Co. E. C. Roberts, vice-president of the Detroit Graphite Co. continues as sales manager of that company, while Frank P. Connolly, manager of the Chicago office of Valentine & Co., has been elected vice-president and will be in charge of the Trade Sales and Industrial Divisions of Valentine & Co.

B & D Stock Change

BALTIMORE, Feb. 1—A reduction in capital value of 298,354 no-par common shares of the Black & Decker Mfg. Co. from $6,262,730 to $1,491,770 has been approved by stockholders on Jan. 30. The difference of $4,770,960 will be transferred to capital surplus account. Patents and good-will will be reduced to $1.

Chevrolet Output 62,000 in January

Production at Highest Level Since July, 1931

DETROIT, Jan. 30 — Chevrolet January production will total 62,000 cars, the highest level reached since July, 1931, according to W. S. Knudsen, president and general manager. "We are building 2500 cars a day," he said. "Half of our assembly plants are on a six-day week. Sales are steadily mounting. The second ten days in January will show an increase of 50 per cent in retail deliveries over the first ten days.

"Our dealers are in the best physical shape in six years. Neither new or used car stocks are a severe problem. Our used car stocks disclose a steady decline between Feb. 1 and Dec. 1, 1932. We have an actual new car shortage.

"Chevrolet employment has risen steadily since last October. The current payroll list of 33,420 represents a gain of 5895 from the low point of last year. Supplementing this total are 23,000 more employed by Fisher Body."

Canadian Imports Down

OTTAWA, Jan. 25—Imports of U. S. automobiles and parts in December, 1932, were valued at $665,000, as compared with $822,000 in the same month a year ago.

William Brookes

William Brookes, president of Ferodo & Asbestos, Inc., died Dec. 31.

Exports, Imports and Reimports of the Automotive Industry For December and Twelve Months Ended December, 1932-1931

	Month of December				Twelve Months Ended December			
	1932		1931		1932		1931	
	Number	Value	Number	Value	Number	Value	Number	Value
Automobiles, parts and accessories	....	$5,117,758	....	$5,548,048	.....	$76,273,755	.....	$138,768,233
Motor trucks, buses and chassis (total)	2,221	1,049,352	1,184	686,289	24,960	11,712,533	44,915	23,566,247
Under one ton	165	45,741	114	37,616	2,226	604,115	6,289	2,141,301
One and up to 1½ tons	1,765	690,455	869	405,772	14,745	7,926,524	33,438	14,596,846
Over 1½ tons to 2½ tons	218	197,792	136	140,591	2,086	1,743,197	3,463	3,999,874
Over 2½ tons	63	110,114	38	79,939	758	1,301,785	1,289	2,308,488
PASSENGER CARS								
Passenger cars and chassis	2,757	1,355,430	1,928	1,218,938	41,441	23,609,420	76,704	47,345,839
Low price range $850 inclusive	2,520	1,089,961	1,559	837,953	35,534	16,978,715	60,982	29,671,531
Medium price range over $850 to $1,200	134	135,003	131	125,548	3,299	3,142,976	9,597	9,212,502
$1,200 to $2,000	48	66,244	73	99,220	1,238	1,638,381	2,699	3,876,196
Over $2,000	10	40,835	48	111,639	586	1,544,460	1,487	3,765,470
PARTS, ETC.								
Parts except engines and tires	....	.....	....	.....	.....	.....	.....	.....
Automobile unit assemblies	....	1,300,794	....	1,928,581	.....	21,047,765	....	37,959,602
Automobile parts for replacement (n.e.s.)	....	966,535	....	1,400,824	.....	12,943,379	....	24,085,180
Automobile accessories	....	114,995	....	199,553	.....	1,466,949	....	3,063,196
Automobile service appliances (n.e.s.)	....	67,232	....	136,489	.....	1,450,691	....	3,563,335
Airplanes, seaplanes and other aircraft	39	835,740	7	75,750	280	4,358,967	129	1,771,160
Parts of airplanes, except engines and tires	....	259,159	....	100,563	....	1,756,421	....	1,526,970
INTERNAL COMBUSTION ENGINES Stationary and Portable								
Diesel and Semi-Diesel	5	32,572	8	15,761	51	220,884	270	344,854
Other stationary and portable								
Not over 10 hp.	125	8,404	205	13,325	3,821	245,787	7,000	541,416
Over 10 hp.	55	23,197	267	120,299	711	344,223	4,397	2,133,613
Automobile engines for								
Motor trucks and buses	40	11,532	200	32,828	1,664	288,672	5,776	822,328
Passenger cars	722	66,990	534	62,643	20,663	1,583,616	18,406	1,458,494
Aircraft	53	414,563	30	143,426	2,356	1,517,682	273	1,280,673
Accessories and parts (carburetors)	....	70,664	....	118,563	....	1,177,877	....	2,015,717
IMPORTS								
Automobile and chassis (dutiable)	46	18,002	86	31,365	540	251,206	679	719,957
Other vehicles and parts for them (dutiable)	....	4,225	....	9,500	....	66,467	....	64,697

Early Chicago Crowds Bigger Than in 1932

Executives Say January Sales Below Last Year But Ahead of December

CHICAGO, Feb. 1—Crowds which were larger than those of 1932 swarmed into the Chicago National Automobile Show on its opening days, Jan. 28 and 29. Saturday attendance ran 12 per cent ahead of last year and on Sunday the total attendance in the morning exceeded the entire Sunday total of last year, the increase for the day amounting to 34 per cent. While there were some indications that the increases might not hold throughout the week, executives in general, and Alfred Reeves, N.A.C.C. general manager in particular, were definitely encouraged by initial interest evidenced by these early increases in paid admissions.

Many executives from the Detroit factories attended the opening as they had in New York, although a number did not appear until Monday. Still no definite trend in sales has been evidenced, the retail market having performed in January much as has the stock market.

Sales increases over last January are reported by some leading makes, particularly those in the low-priced field, although a majority of all car makers probably will have recorded a decline from last year when the final first month figures are in.

January sales all along the line exceeded those of December as might be expected, although large gains were not recorded in all cases.

The revised Ford V-8 model did not make its appearance during the early days of the show as had been expected by many close observers, but there is less disposition among executives this year than ever before to feel that the Ford announcement will affect the general market materially one way or the other. Its competitive importance, of course, is still fully recognized.

Rumors of several other new models in addition to the expected Ford announcements floated about the hotel lobbies even as the newest creations were being displayed at the show. Some of these may merely be slight modifications of existing jobs, while others are said to be in the nature of distinct additions to present lines.

All of the fine showmanship which characterized the New York Show is again being repeated in Chicago with similar marked effects on public interest.

C. E. Wertman Elected Whitney President

HARTFORD, CONN., Jan. 31—Charles E. Wertman has been elected president of the Whitney Mfg. Co. to succeed the late Clarence E. Whitney. At the same time Mrs. Clarence E. Whitney was elected vice-president.

Mr. Wertman has been associated with the company he now heads for 17 years and prior to that time was connected with the Matheson and Packard companies.

Prussing Heads G.M. Cab Sales

DETROIT, Jan. 30—H. A. Prussing, Western sales manager, taxicab division, General Motors Truck, has been named vice-president directing cab sales. H. A. Yagle, Eastern sales manager, taxicab division, named general sales manager taxicab division.

Permite Names Trefz

Appointment of Walter Trefz as service engineer for Aluminum Industries, Inc., Cincinnati, has just been announced by C. W. McDaniel, director of sales for the company. He will be assisted in his new capacity by W. E. Bennett.

Black Heads Sales

R. D. Black, former advertising manager of Black & Decker Mfg. Co., Towson, Md., has been appointed general sales manager.

CALENDAR OF COMING EVENTS

FOREIGN SHOWS

Berlin International .....Feb. 12-22

SHOWS

Indianapolis, Ind., Automobile Show .....Feb. 4-11
St. Paul, Minn., Automobile Show Feb. 4-11
Omaha, Neb., Automobile Show, Feb. 6-10
Denver, Colo., Automobile Show Feb. 6-11
Springfield, Ill., Automobile Show Feb. 9-11
Kansas City Automobile Show.Feb. 11-18
Toledo, Ohio, Automobile Show.Feb. 11-18

MEETINGS

National Metal Congress, Detroit Oct. 2-6
Rapid City, S. D., Automobile Show Feb. 14-18
Peoria, Ill., Automobile Show..Feb. 15-19
Wichita, Kans., Automobile Show Feb. 21-24
Holyoke, Mass., Automobile Show .....Feb. 22-25
Evansville, Ind., Automobile Show Feb. 24-26
Albany, N. Y., Automobile Show Feb. 25-Mar. 4
Seattle, Wash., Automobile Show .. Feb. 26-Mar. 4
Des Moines, Iowa, Automobile Show .....Feb. 27-Mar. 4

N. Y. Plans One Cent Increase in Gas Tax

Will Add $15,000,000 to Motorists' Burden During Coming Year

ALBANY, N. Y., Jan. 31—Another $15,000,000 will be loaded onto the shoulders of New York State motorists under the 1933-1934 budget presented to the Legislature by Governor Lehman. The new budget proposes another one cent increase in the gasoline tax, bringing this levy up to four cents and with the Federal tax to five cents per gallon.

At the same time the governor proposes that state aid for county and town roads be cut $3,500,000.

Special motor vehicle taxes with the increased gasoline levy, it is officially estimated, will total $89,500,000, consisting of $34,500,000 in license fees and $55,000,000 in gasoline taxes. Lacking an expert analysis of the budget, it is difficult to estimate what highway expenditures will be in the fiscal year 1933-1934, but the total expenditures budgeted under public works amount only to $18,833,612. After making allowance for debt service on highway bonds, it seems like a fair guess that motorists of the Empire State will contribute to the general funds $50,000,000, or more, in special taxes.

Kelsey-Hayes Reorganization

DETROIT, Jan. 30—Dissolution of the old Kelsey-Hayes Wheel Corp., which was succeeded by a new company under the reorganization plan of November, 1932, will be acted upon at a stockholders meeting called for Feb. 8.

Kurtz to Milwaukee

MILWAUKEE, Jan. 31—L. H. Kurtz, formerly of Oakland, Calif., has been appointed zone manager of the Buick-Olds-Pontiac Sales Co. at Milwaukee. He succeeds P. S. Steenstrup, who has been transferred to Oakland.

Shedore Advanced

CLINTONVILLE, WIS., Jan. 30—Four Wheel Drive Sales Company announces the appointment of T. G. Shedore, former manager of the National Accounts Department, to the position of Assistant Sales Manager.

Joseph Deins

Joseph Deins, who in recent years staged clean-up sales for a number of important car makers thereby attracting considerable attention to himself, died a few days ago in Cincinnati of pneumonia.

Annual S. A. E. Meeting at Detroit

(Continued from page 131)

Increased cooling by reducing the spacing between fins externally would probably be accompanied by an increased gradient from liquid to jacket wall only through the use of internal finning, according to Mr. Geisse.

He stated that independent estimates gave the indirect system of cooling an in-line engine about 60 per cent of the air resistance of the direct-air-cooled radial engine with modern cowling, mainly through the reduction in "form resistance," the engine itself being made into a streamlined shape.

Compared with liquid-cooled engines Mr. Geisse claimed a fin and coolant weight less than that for radiator and coolant. Compared with direct air cooling he pointed out that liquid cooling as used permitted a closer cylinder spacing and consequent shortening of the entire engine.

It was to be expected that Mr. Geisse would not find universal agreement with his ideas from the audience. Arthur Nutt, Wright Aeronautical Corp., in a written discussion presented, made the statement that the indirect system had the disadvantages of both liquid and air cooling, and the advantages of neither.

Referring to mention by Mr. Geisse of cylinder distortion (although this was of a permanent-set character), P. B. Taylor, chairman of the session, suggested that a conventional liquid-cooled engine might be taken and the jacket walls finned. To this Mr. Geisse replied that such a move would invalidate the advantages of the design with respect to light weight and inherent rigidity.

Air Mail Volume Well-Maintained

Other papers presented at this session included one on "Commercial Flight Test Equipment and Methods," by A. L. MacClain, Pratt & Whitney Aircraft Co., and D. S. Hersey, United Aircraft & Transport Corp.; "Airplane Flight Testing for Maximum Speed," by F. M. Thomas and H. W. Fairchild, United Aircraft, and "Correlation of Propeller and Engine Power with Supercharging," by F. W. Caldwell, Hamilton Standard Propeller Co., and F. M. Thomas of United Aircraft. The last mentioned dealt mainly with variable pitch propellers.

At the aircraft session which followed, Tuesday evening, Col. Clarence M. Young, Assistant Secretary of Commerce for Aviation, gave a summary of developments in "Scheduled Air Transportation and the Federal Airways System." With the exception that air mail carried suffered a recession in 1932, with increased postal rates, the past year has, as have other years, shown a substantial gain. Air mail carried during 1932 was approximately 8,000,000 lb.—passengers about 536,000 on scheduled airways, and express approximately 1,500,000 lb. Scheduled operations are estimated to have been in the neighborhood of 50,000,000 miles during the past year.

Low-pressure balloon tires, automatic transmissions, automatic clutches, and clutch control—subjects which are perhaps more than any others in the foreground at the present time in relation to passenger car design—were crowded into a busy chassis session Wednesday afternoon. Discussion had to be forcibly abbreviated by Chairman P. L. Tenny, Muncie Products Co., after each paper.

Walter C. Keys Discussed Automatic Transmission

It was unfortunate, perhaps, that Walter C. Keys, consulting engineer, could not be given access to information regarding some of the automatic shift and automatic transmission developments under way in many plants, but he did include in his paper two types developed by independent concerns which have only recently appeared.

Both of these are of the gear type. One, designed by T. B. Tyler, incorporates a vacuum shift mechanism with governor control of the valves. The shift in this transmission is obtained at the instant when the foot pressure is released from a button built into the accelerator pedal. This transmission has already been mentioned in these columns, having been exhibited at the Detroit Automobile Show, and its description is scheduled for an early issue of *Automotive Industries*.

The same is true of the Banker automatic shift transmission, which employs only mechanical energizing means for the shift. In this transmission shifting into second and high, respectively, is accomplished within the unit by reversal of torque when the throttle is closed. This transmission does not have a master clutch, but internal expanding individual brake-type clutches for each gear.

In the discussion of Mr. Keys' paper, Phil Kent, Chrysler Corp., took exception to the complicated designs of the transmissions described. He suggested consideration of electro-magnetism as a power transmitting means, dividing power transmission into three groups—mechanical, friction and power types. Mr. Keys agreed with Mr. Kent that evidently automatic transmissions would be complicated at the start and simplified later.

"The Future of Low Pressure Balloon Tires," the subject of a paper by A. F. Denham, field editor, *Automotive Industries*, provoked considerable discussion. Mr. Denham did not attempt to predict the future of these tires, but rather set out the fundamentals which will influence their growth or decline in popularity for standard equipment. Chassis changes necessary with these tires, as found by various manufacturers, were discussed. This paper will appear in an early issue.

In discussion, B. J. Lemon, United States Rubber Co., pointed out that designers have not recognized in their 1932 cars the need for changes in castor, camber and toe-in to go with possible adoption of these tires as suggested in Mr. Denham's paper. Mr. Lemon also contended that with these tires pressures must be lowered to obtain advantages in riding qualities. Mr. Denham pointed out that a gain in this direction, so far has been offset by reduction in tire mileage, when

pressures are decreased, and the two would have to be balanced.

J. E. Hale, Firestone Tire & Rubber Company, in a prepared discussion received at the meeting, stated that he believed the future of these tires depended on the following factors:

1. How much increased cost car manufacturers will be willing to absorb.
2. How much engineers can minimize defects accompanying use of these tires.
3. How well tire companies can safeguard needs of public, especially with relation to cost per mile.

Mr. Hale believed that tire life was a direct function of tire cross-section, load and deflection. Contrasting with the attitude of most car engineers, Mr. Hale recommended the lubrication of springs with the new tires. He also estimated a cost and weight increase of 15-25 per cent, for wheels and tires.

Tore Franzen, Chrysler Corp., said that spring rates should come down for the new tires. This again has not been possible so far with experimental installations. In most cases spring rates have actually been increased, according to Mr. Denham.

The discussion also demonstrated differences of opinion as to whether or not power steering would be necessary for medium and larger cars with the lower pressure tires.

E. E. Wemp, Long Mfg. Co., in his paper, "The New A.B.C. of Clutch Design," gave three angles of approach to future clutch development: automatic clutches, basic improvements in lever-release units, and clutch control through external means of conventional design.

Under potential improvements in design he listed design of driven disc and selection of facings to produce improved engagement and greater life. In this respect he recommended woven facings where a low wear-factor is essential. He also urged design of cover plate assembly to permit higher spring pressures with less retracting movement of the pressure plate and better selection of facing and pressure plate materials to reduce facing wear and pressure plate distortion or scoring.

More Automatic Clutch Data

Under automatic clutch Mr. Wemp listed centrifugal clutches and fluid couplings. Vacuum types were the only ones listed by Mr. Wemp under clutch control. The author felt that of the two types of automatic clutches the centrifugal was the best suited to American practice at the present time. Such clutches, however, for maximum effectiveness should be used in connection with freewheeling units, and should be convertible from automatic to conventional at the driver's option for special conditions. They will require closer manufacturing tolerances and better workmanship than present-day types to function properly.

Four papers were presented at the fuels and lubricants session. O. C. Bridgeman, H. S. White and F. B. Gary of the Bureau of Standards collaborated on the summarizing of information to date on "The Vapor Handling Capacity of Automobile Fuel Systems." "Correlation of C. F. R. Laboratory Knock Ratings with Behavior of Motor Fuels in Service" was presented by H. W. Best, Yale University, with whom there collaborated C. B. Veal, S.A.E., J. M. Campbell, General Motors Research Laboratories, and W. M. Holaday, Standard Oil Company of Indiana, members of the cooperative committee on fuel research.

"The Load-Carrying Capacity of Extreme Pressure Lubricants," on which S. A. McKee, E. A. Harrington and T. R. McKee of the Bureau of Standards cooperated was presented by S. A. McKee. Dr. Bridgeman spoke extemporaneously on the subject of "Friction Data in the Region of Thin Film Lubrication."

It was interesting to note that after the numerous papers which have been presented before the S.A.E. on the subject of vapor lock, there still remained questions in the discussion by capable engineers as to just what constituted "vapor lock."

Mr. Best's paper and discussions which followed threw serious doubts as to the value in practice of the C.F.R. (cooperative fuel research) fuel rating method for anti-knock qualities. Road tests at Uniontown Hill showed not only wide divergence from results to be expected, but also considerable variation among different cars.

The conclusion which apparently could be drawn from this is that so far neither the C.F.R. Research method or the C.F.R. Motor Rating method, developed as a result of the recent work, can be accepted as substitutes for road tests in individual cars under consideration. However, the new C.F.R. Motor method does appear to approximate actual conditions much closer. Of the various changes, the most important is in the increase of intake gas temperature.

In the discussion following Mr. McKee's paper, it was disclosed that Mr. McKee has under development a machine for the testing of extreme pressure lubricants which will closely approximate conditions encountered in actual practice, as in rear axles. This effectively settled the contention that the test results obtained from earlier experiments by Mr. McKee were not applicable to actual conditions. With this contention Mr. McKee was not in disagreement. Dr. Bridgeman, however, pointed out that even with the new machine it would not be possible to duplicate exactly service conditions, and H. C. Mougey, General Motors Research, clarified the picture further by pointing out that test work on testing machines is qualitative rather than quantitative and good mainly for checking characteristics of unknown lubricants against those of known characteristics.

Dr. Bridgeman's address on the subject of thin film lubrication precipitated a revival of the argument between passenger car engineers and representatives of the Bureau of Standards and the Standard Oil Company as to what constitutes a criterion for determination of bearing capacity, etc.

Dr. Bridgeman offered conclusions from early experimental data that in the boundary region between thick and thin film lubrication, the coefficient of friction was apparently independent of load at high temperatures, and that variations are due to viscosity changes on account of oil temperature.

R. N. Janeway, Chrysler Corporation, brought to light a series of tests conducted at the University of Michigan in which it was attempted to duplicate as nearly as possible actual service conditions by using a conventional cylinder block and eccentrically loaded shaft in conventional bearings. The results of these tests were plotted against theoretical PV (pressure-times-velocity) and zn/P (absolute viscosity times speed divided by pressure) curves.

Above 2600 r.p.m. the experimental data checked with the PV curve. Robert E. Wilson, Standard Oil Company, said that while zn/p seemed to hold up to a certain point, the criterion beyond that might not be PV.

Fellows

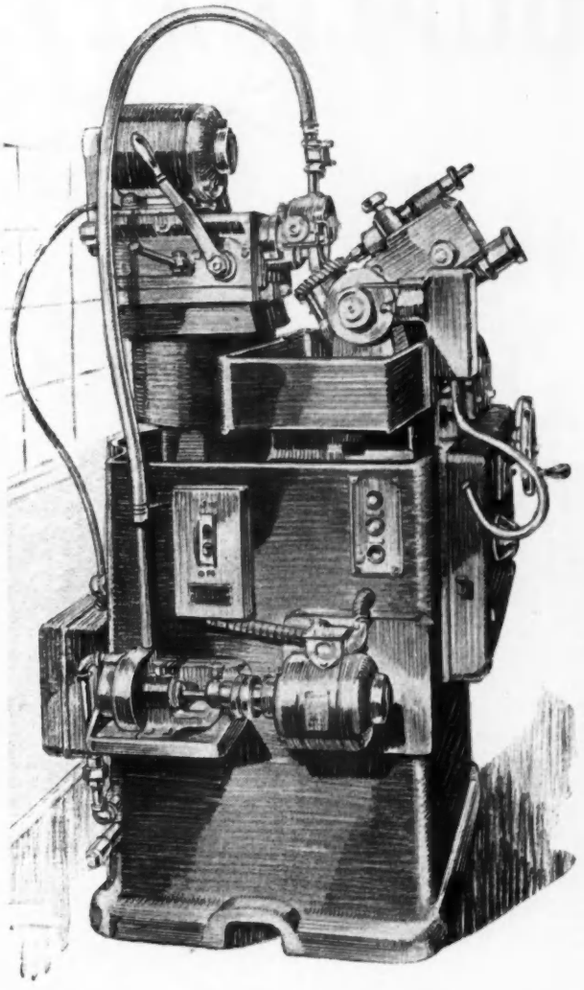
puts ACCURACY in the Cutter . . . .

. . . KEEP it there with a *Fellows* HELICAL CUTTER SHARPENING MACHINE

THE Fellows Gear Shaper Cutter is a precision tool, the high accuracy of which can be impaired by improper resharpening. In order to retain the original accuracy of the cutter and maintain duplication of accuracy of gears cut, your Helical Gear Shaper Cutters should be RESHARPENED on the Fellows Automatic Helical Cutter Sharpening Machine.

On this machine you get rapid and accurate resharpening without danger of burning the keen cutting edges—or dependence upon the operator's skill. The machine is fully automatic, (1) Clamp the cutter on the spindle and (2) feed the wheel to the work. Indexing and reciprocation of the cutter for tooth-to-tooth sharpening are automatic, and the machine stops after each complete revolution of the cutter.

Your gear production department will obtain the maximum percentage of accept-



able gears when your Gear Shapers are tooled with ORIGINAL FELLOWS CUTTERS—resharpened on the Fellows Automatic Helical Cutter Sharpening Machine.

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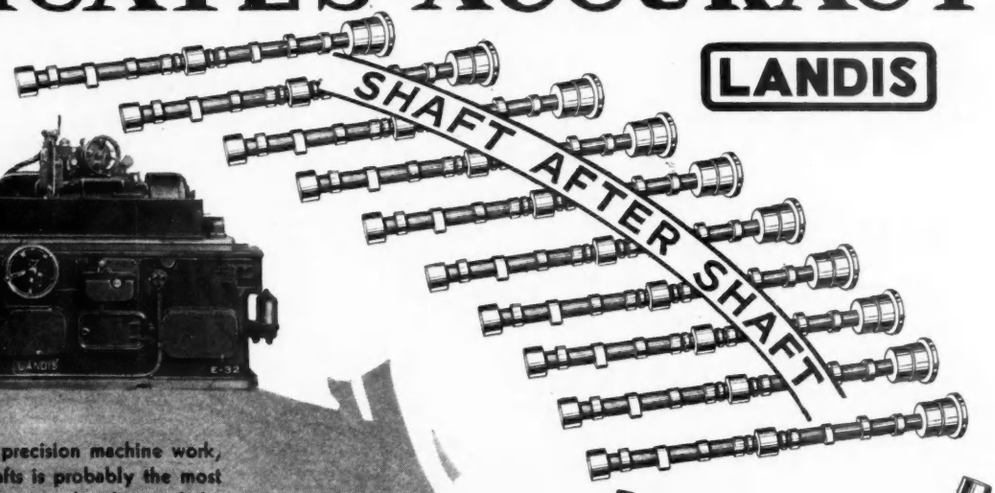
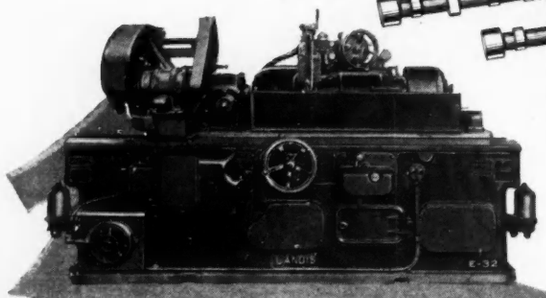
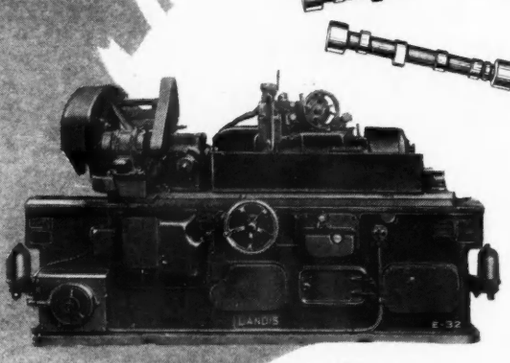
The LANDIS DUPLICATES ACCURACY

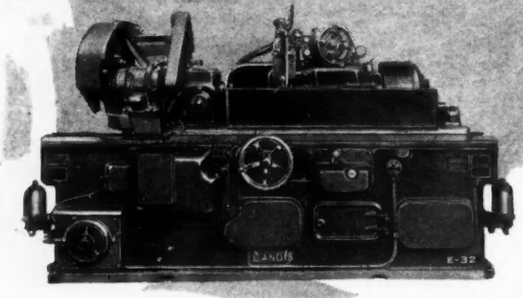


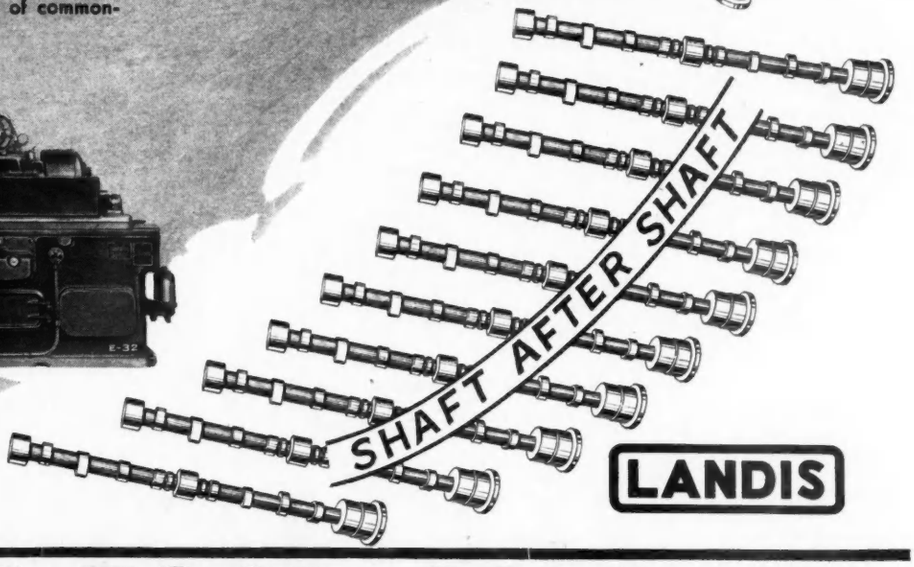


Of all the forms of precision machine work, the grinding of camshafts is probably the most difficult because of the irregular shape of the work, coupled with the degree of accuracy required. Nor is it sufficient that this accuracy be secured spasmodically, but day in and day out, week in and week out.

The Landis 5"x40" Semi-Automatic Hydraulic Cam Grinder does just this. It duplicates accuracy shaft after shaft, shaft after sheft, within limits that up until a comparatively short time ago could not be secured on a high production basis. Other advantages besides the one just mentioned help to make the installation of these new Landis cam grinders a matter of common-sense dollar-and-cents saving.







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STEWART-WARNER *Twin*

MECHANICAL WINDSHIELD WIPER

IS DRIVEN BY AN ENGINE OPERATED *Flexible Shaft*

THE NEW STEWART-WARNER MECHANICAL WINDSHIELD WIPER is especially designed to provide better vision in all weather.

NOTHING IN SIGHT—not even a wiper blade to obstruct the view in clear weather.

A WIDER RANGE OF VISION IN STORMY WEATHER. The 150-degree arc cleans 40% greater area than ordinary wiper.

THE DOWN WIPE OF THE TWIN BLADES INSURES CLEAR VISION. Accumulated snow and rain once wiped off can't run back on the cleaned area.

ACTION IS STEADY IN PROPORTION TO CAR'S SPEED. No stopping as with vacuum wipers.

BLADES WORK TOGETHER. They cannot get out of time.

CONCEALED MECHANISM—factory-installed under the cowl.

BLADES DISAPPEAR from driver's sight when not in use.

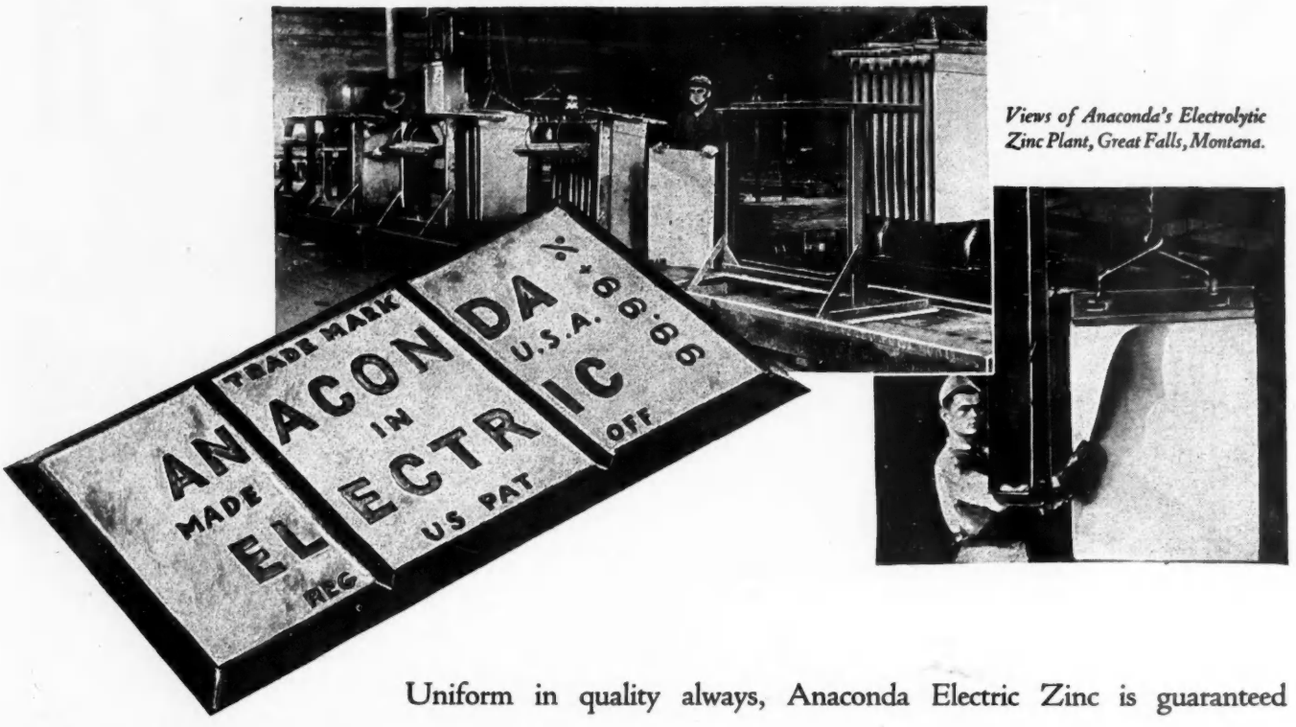
EASY TO START—NO MOVING PARTS TO WEAR WHEN NOT OPERATING. The flexible shaft and the mechanism does not move until a finger-pressure throws in the clutch.

AUTOMATIC SAFETY DEVICE disconnects blades should they freeze to the windshield and automatic pick-up starts them in motion again. Blades automatically disengage when windshield is opened—and engage when it is closed.

BUILT TO LAST AS LONG AS THE CAR—noiseless and dependable in operation—offering features that the public appreciates and wants; this new Stewart-Warner Twin will help sell more cars.

FACTORY INSTALLATION IS SIMPLE. Our engineers are at your command. Stewart-Warner Corporation, Chicago, U. S. A.

Electrolytic Refining assures Zinc 99.99+% pure



Views of Anaconda's Electrolytic Zinc Plant, Great Falls, Montana.

CADMIUM

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Cadmium plating gains new adherents every year. For this and other applications throughout industry, Anaconda Cadmium 99.95% pure is widely used.

Uniform in quality always, Anaconda Electric Zinc is guaranteed 99.99+% pure by the world's largest producer of Zinc. This high standard of purity is made possible by the *electrolytic* refining process—pioneered and developed by Anaconda. Anaconda Electric Zinc is supplied in 50 lb. slabs clearly marked "ANACONDA ELECTRIC". Whenever this well-known brand is used for the base of Zinc die castings, you are certain of obtaining uniform, dependable metal.

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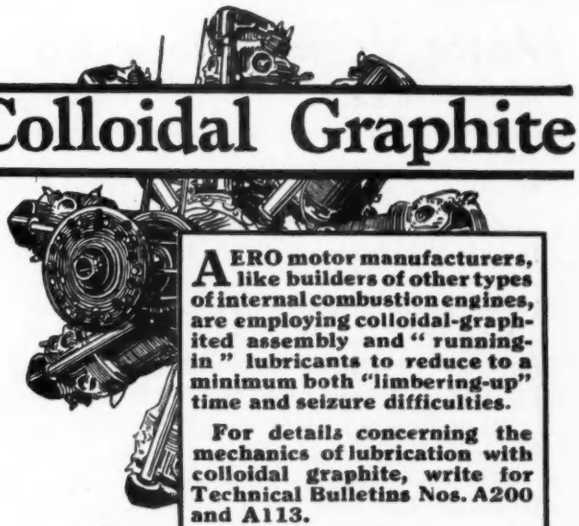

AERO motor manufacturers, like builders of other types of internal combustion engines, are employing colloidal-graphited assembly and "running-in" lubricants to reduce to a minimum both "limbering-up" time and seizure difficulties.

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Manufacturers of Colloidal Graphite Products

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Here Is An Outline of Responsible for the *Intense* 15th Annual of AUTOMOTIVE

World Registrations

Trend of World & U. S. Registrations 1919-1932 Chart
Summary of World Registrations 1932
Foreign Registrations 1925-1932
U. S. Registrations 1895-1932
U. S. Motor Vehicle Registrations by States 1931-1932
U. S. Motor Vehicle Registrations by States 1927-1932
U. S. Motor Vehicle Taxes (Registration and Gas Tax)
World Registrations by Countries

Motor Vehicle Production

World Production Trends 1924-1932 Chart
Canadian Motor Vehicle Production 1922-1932
1932 Production Summary
World Car and Truck Production 1930-1932
Truck Production by Capacities 1928-1932
Estimated Number of U. S. Passenger Cars Scrapped in 1923-1932
Percentage of Scrapped Cars Junked by Factories in 1932
European Production Totals 1924-1932
Division of Passenger Car Production by Number of Engine Cylinders 1926-1932
Motor Vehicle Production U. S. & Canada 1912-1932
Passenger Car Production by Leading Mfg. Groups 1927-1932
Monthly Motor Vehicle Production 1925-1932

General Statistics

Open & Closed Car Production by Retail Price Classes 1921-1932
Percentage of Passenger Car Production (By Retail Price Classes) 1921-1932
Per Cent of Car Production by Body Types 1928-1932
Raw Materials used in Automotive Industry 1932
Tire Production by Types 1926-1932
New and Used Car Financing Data 1930-1932
U. S. Production and Sales of Airplanes 1932
Gasoline Consumption by States 1932
Export Value of Aircraft Engines and Parts—Chart
Aircraft Exports 1929-1932
U. S. Airplane Production 1925-1932
U. S. Airplane Engine Production 1926-1932
Scheduled Transport Operations of American Air Lines 1927-1932
Census of Numbered Motor Boats

Published February 25th

It Lives

AUTOMOTIVE

A Chilton

Chestnut and 56th Sts.,

the FACTS and FIGURES READER INTEREST In The Statistical Issue

INDUSTRIES

Automotive Marketing Data

New Car Domestic Sales by Makes 1929-1932
1932 Passenger Car Sales by States
Average Retail Price of Trucks (Chart and Table) 1921-1932
World Distribution of Automotive Sales Outlets
New Motor Vehicle Sales per Dealer (Chart and Table) 1924-1932
Average Retail Price of Passenger Cars (Chart and Table) 1921-1932
Sales Outlets and Population by States

Exports

Total Foreign Consumption of Motor Vehicles of U. S. Design 1914-1932
Imports into U. S. of Motor Vehicles 1918-1932
Foreign Sales of American Motor Vehicles 1921-1932
Ratio of U. S. Exports to Production 1923-1932
Passenger Car and Truck Exports
U. S. Exports of Parts and Accessories

Automotive Insurance Statistics

Latest available figures on all phases of automotive insurance—for the first time in a Statistical Issue of AUTOMOTIVE INDUSTRIES. The volume of automotive casualty, fire and theft insurance will be recorded, together with the loss ratio of leading insurance companies on this automotive business.

Specifications Section

(42 pages)

American Passenger Car Engines
American Passenger Car Chassis
Price, Weight & Body Tables
American Agricultural Tractors
American Trucks
American Gasoline Bus Chassis
American Stock Engines
American and Foreign High Speed Diesel Engines
American Stock Rear Axles
American Stock Gearsets
American Stock Steering Gears
American Stock Front Axles
American Stock Clutches
American Airplanes
American Airplane Engines

Forms Close February 20th

A Year

INDUSTRIES

Publication
Philadelphia, Pa.

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BROS. & CO.
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AUTOMATIC SCREW MACHINES. SPECIAL MACHINERY

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COLD DRAWN SEAMLESS STEEL TUBING
Shelby, OHIO.

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Also CELORON Timing Gears and Diamond Vulcanized Fibre.
CONTINENTAL-DIAMOND FIBRE CO.
Newark, Delaware

BUYERS' GUIDE

Automotive Products and Factory Equipment Manufactured by Advertisers in This Issue

See Alphabetical List of Advertisers on Page 48

This Advertiser's Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

Arms & Knuckles, Steering
Atlas Drop Forge Co.

Axles
Atlas Drop Forge Co.
Park Drop Forge Co.

Bearings, Anti-Friction
Ball
Federal Bearings Co., Inc.
S. K. F. Industries, Inc.

Roller
Hyatt Roller Bearing Co.
S K F Industries, Inc.

Thrust
S. K. F. Industries, Inc.

Bending & Straightening Machines
Chambersburg Engineering Co.
Chambersburg-National Co.
National Machinery Co.

Blanks
Forged
Atlas Drop Forge Co.

Boring Machines
Baker Brothers, Inc.
Foote-Burt Co.

Brake Boosters
Bragg Kliesrath Co.
Stewart-Warner Corp.

Brake Drums
Gunite Foundries Corp.

Brakes
Mechanical
Bendix Brake Co.
Eclipse Machine Co.
Stewart-Warner Corp.

Brass & Copper
American Brass Co.

Bumpers
Stewart-Warner Corp.

Bushings
Fibre
Continental-Diamond Fibre Co.

Cable
Ignition, Starting & Lighting
American Brass Co.

Camshafts
Atlas Drop Forge Co.
Gunite Foundries Corp.

Castings
Gray Iron
Gunite Foundries Corp.

Channels for Glass
Felt
American Felt Co.

Cleaners
Metal
American Chemical Paint Co. (Rust Preventive)

Clutches
Bragg Kliesrath Co.

Connecting Rods
Atlas Drop Forge Co.

Crankshafts
Atlas Drop Forge Co.
Park Drop Forge Co.

Cutters
Baker Brothers, Inc. (Keyseating)
Davis Keyseater Co. (Keyseating)
Fellows Gear Shaper Co. (Gear)

Dashes, Truck
Stopler Steel Products Co.

Drilling Machines
Baker Brothers, Inc.
Foote-Burt Co.
Greenlee Brothers and Co. (Multiple Spindle)

Enamels
American Chemical Paint Co. (Rust Proofing)

Felt
American Felt Co.

Fenders
Stopler Steel Products Co.

Fibre Rods, Sheets, Tubes
Continental-Diamond Fibre Co.

Forgings
Atlas Drop Forge Co.
Park Drop Forge Co.

Furnaces Electric
(Annealing, Carburizing, Heat Treating, Forging & Welding)
Electric Furnace Co.

Gaskets
Felt
American Felt Co.

Gear Cutting Machines
Fellows Gear Shaper Co. (Shapers)

Gear Material
Non-Metallic
Continental-Diamond Fibre Co.

Gears, Timing
Non-Metallic
Continental-Diamond Fibre Co.

Grinding Machines
Fellows Gear Shaper Co.
Landis Tool Co.
Universal
Landis Tool Co.

Hammers, Power
Chambersburg Engineering Co.
Chambersburg-National Co.
National Machinery Co.

Hangers, Shafting
S. K. F. Industries, Inc.

Heat Treating
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Gibson, Wm. D., Co.

Heaters, Car
Stewart-Warner Corp.

Hoods
Stopler Steel Products Co.

Hose, Flexible Metallic (Radiator & Fuel Lines)
Titeflex Metal Hose Co.

Hubs, Wheel
Gunite Foundries Corp.

Insulating Material
Continental-Diamond Fibre Co.

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Baker Brothers, Inc.
Davis Keyseater Co.

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SALEM, OHIO

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ELECTRIC AND FUEL FIRED FURNACES

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AMERICAN FELT CO.
NEW YORK DETROIT CHICAGO

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Heavy, medium and light stampings in any quantity. A steady flow of production—*when* you want it.
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· QUALITY STAMPINGS ·

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and
Heavy Drop Forgings
THE PARK DROP FORGE CO.
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Tell us the purpose and we will design a plate for your approval.
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DRILLING : BORING and TAPPING EQUIPMENT
A complete line including gear or hydraulic feed, single or multiple spindles vertical, horizontal and way type.
BAKER BROTHERS, INC. TOLEDO, OHIO

BUYERS' GUIDE—Continued

Lapping Machines
Fellows Gear Shaper Co.

Lathes
Automatic Chucking
Potter & Johnston Machine Co.
Turret
Potter & Johnston Machine Co.

Molded or Machined Parts (Phenolic)
Continental-Diamond Fibre Co.

Name Plates
Auld, D. L., Co.

Oil
Break In
Acheson Oildag Co.
Lubricating
Acheson Oildag Co.

Pads
Felt
American Felt Co.

Paints
American Chemical Paint Co. (Heat Resisting).

Pickling Compounds
American Chemical Paint Co.

Plates, Clutch Pressure
Gunite Foundries Corp.

Plugs, Expansion
Hubbard Spring Co., M. D.

Presses
Chambersburg Engineering Co.
Chambersburg-National Co.
National Machinery Co.

Removers, Enamel & Paint
American Chemical Paint Co.

Rust Proofing
Parker Rust Proof Co.

Rust Removers & Preventives
American Chemical Paint Co.

Screw Machine Products
Barnes, Wallace Co.

Screw Machines
Greenlee Brothers & Co.
Potter & Johnston Machine Co.

Shock Absorbers
Stewart-Warner Corp.
John Warren Watson Co.

Special Machinery
Baker Brothers, Inc.
Greenlee Brothers & Co.

Speedometers & Tachometers
Stewart-Warner Corp.

Springs
Extension, Compression Torsion or Flat
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Cook Spring Div.
Gibson, Wm. D., Co.
Hubbard Spring Co., M. D.
Mather Spring Co.
Raymond Mfg. Co.
Leaf
Mather Spring Co.

Stampings or Drawings Metal
Auld, D. L., Co.
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Cook Spring Div.
Gibson, Wm. D., Co.
Hubbard Spring Co., M. D.
Raymond Mfg. Co.
Stopler Steel Products Co.
Worcester Stamped Metal Co.

Starter Drives
Bendix Brake Co.
Eclipse Machine Co.

Steam Cooling
Rushmore Laboratory

Steel
Alloy
Republic Steel Corp.
Bars
Republic Steel Corp.
Carbon
Republic Steel Corp.
Cold Drawn
Republic Steel Corp.
Spring
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Gibson, Wm. D., Co.
Stainless
Republic Steel Corp.
Strip
Republic Steel Corp.
Thomas Steel Co.

Tank Support Straps
Stopler Steel Products Co.

Tanks
Stopler Steel Products Co.

Tapping Machines
Baker Brothers, Inc.
Foote-Burt Co.
Greenlee Brothers & Co.

Thread Generators
Fellows Gear Shaper Co.

Tubes, Axles, Steering Column & Torque
Ohio Seamless Tube Co.

Tubing
Flexible Metal
Titeflex Metal Hose Co.
Seamless
Ohio Seamless Tube Co.
Steel
Ohio Seamless Tube Co.

Tubular Products
Ohio Seamless Tube Co.

Turret Machines Automatic
Potter & Johnston Machine Co.

Vacuum Tanks
Stewart-Warner Corp.

Washers
Felt
American Felt Co.
Lock
Shakeproof Lock Washer Mfg. Co.
Plain Metal
Hubbard Spring Co., M. D.

Wicks
Felt
American Felt Co.

Window Regulators
Ackerman-Blaesser-Fezzey, Inc.

Windshield Wipers
Stewart-Warner Corp.

Wire
Flat, Round, Square or Special Shape
American Brass Co.
Barnes, Wallace Co.
Spring
Barnes, Wallace Co.
Republic Steel Corp.

Wrenches
Gunite Foundries Corp.

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WITH

Steam Cooling

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PAWTUCKET, R. I., U. S. A.

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DETROIT, 2457 Woodward Ave.

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RODINE— Pickle Bath Control
STRIPPLE High Speed Enamel Remover
PEROLINE— Rust Preventing Oil
KEMICK— Manifold Paint
FLOSOL— Soldering Flux
PARADOX— Rust Proofing Enamel

AMERICAN CHEMICAL PAINT CO.
AMBLER, PENNA.

Index to Advertisers

The Advertisers' Index is published as a convenience, and not as a part of the Advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

A

Acheson Oildag Co. .. 43
Acherman-Blaesser-Fezzey, Inc. 46
American Chemical Paint Co. 48
American Felt Co. 47
Atlas Drop Forge Co... 43
Auld Co., D. L. 47
Automotive Industries 44-45

B

Baker Brothers, Inc. .. 47
Bragg - Kliesrath Corp. (Subsidiary of Bendix Aviation Corp.) Second Cover-1

C

Chamersburg Engineering Co. 48
Continental - Diamond Fibre Co. 46

E

Electric Furnace Co. .. 47

F

Federal Bearings Co., Inc. 5
Fellows Gear Shaper Co. 39
Foote-Burt Co..... 8

G

Greenlee Bros. & Co. .. 46
Gunite Foundries Corp. 46

H

Hubbard, M. D., Spring Co. 48
Hyatt Roller Bearing Co. 7

L

Landis Tool Co. 40

M

Mather Spring Co. 43

N

National Machinery Co. 48

O

Ohio Seamless Tube Co. 46

P

Park Drop Forge Co. .. 47
Parker Rust-Proof Co. 4
Potter & Johnston Machine Co. 48

R

Republic Steel Corp. Third Cover
Rushmore Laboratory . 48

S

SKF Industries, Inc. .. 2
Shakeproof Lock Washer Co. 6
Stolper Steel Products Corp. 46
Stewart - Warner Corp. Front Cover-41

T

Thomas Steel Co. 3

U

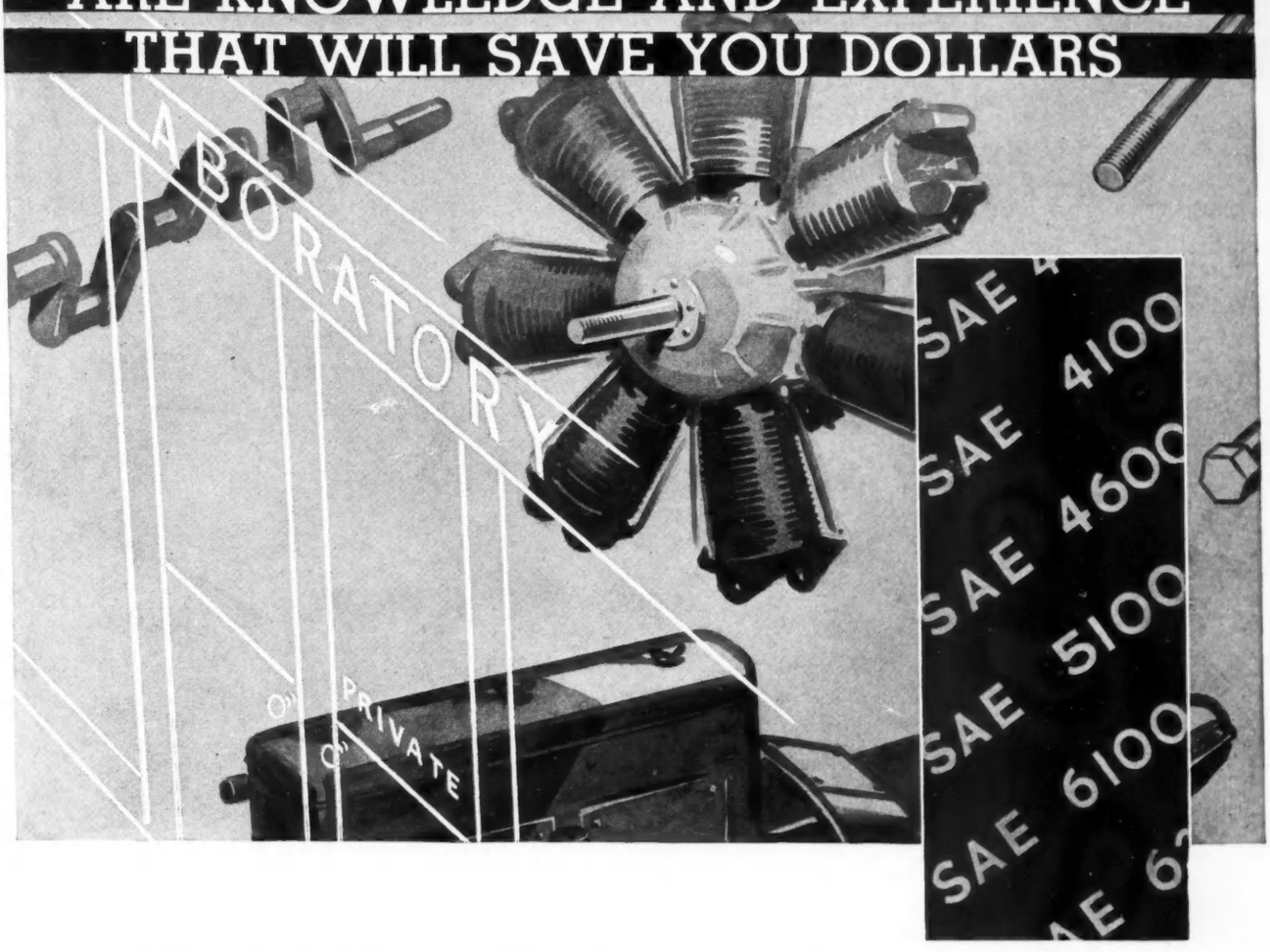
United Metals Selling Co. 42

W

Watson, John Warren, Co. .....Back Cover
Worcester Stamped Metal Co. 47

BEYOND THESE DOORS

ARE KNOWLEDGE AND EXPERIENCE THAT WILL SAVE YOU DOLLARS



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The use of these softer front springs makes the back seat as good as the front—every bit.

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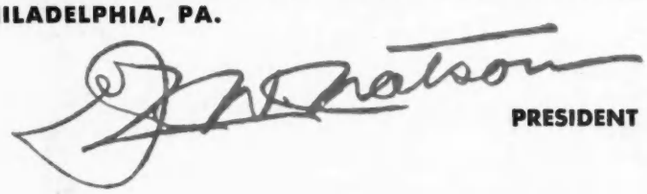

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